TNRCC

Revised January 1996
RG-25

AIR QUALITY MODELING GUIDELINES

Air Quality Planning Division

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

printed on recycled paper

TNRCC

Revised January 1996
RG-25

AIR QUALITY MODELING GUIDELINES

Air Quality Planning Division

printed on recycled paper

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

TNRCC

Published and distributed
by the
Texas Natural Resource Conservation Commission
Post Office Box 13087
Austin, Texas 78711-3087

TABLE OF CONTENTS

1.0 Introduction

The Office of Air Quality's Modeling Section staff (Modeling staff) developed this guideline to document the Texas Natural Resource Conservation Commission (TNRCC) air quality analyses procedures. This publication replaces the previous edition of the *Air Quality Modeling Guidelines,* November 1993, and the *TACB/EPA Suggested Approach for PSD Modeling Protocols*, December 1, 1992. Significant changes in procedures are identified by double asterisks (**) at the beginning of the appropriate paragraph or sentence.

This guidance focuses on the application of air dispersion models and procedures to meet air permitting requirements of the TNRCC and is not a modeling primer. The Modeling staff assumes that the reader has a basic knowledge of air dispersion modeling theory and techniques.

1.1 What is Air Dispersion Modeling?

Air dispersion modeling is a tool to predict concentrations from one or more sources of air pollution. Equations and algorithms representing atmospheric processes are incorporated into various computer models. Agency personnel use the results from these models in their review of permit applications.

1.2 Authority For Modeling

The authority for air dispersion modeling is contained in the TNRCC Regulation VI (TNRCC, 1995a), which states that modeling may be required by the TNRCC New Source Review Division (Permits staff) to determine the air quality impacts from a proposed new facility or source modification. In addition, modeling may be required for other permitting purposes, such as modeling for standard exemptions.

1.3 Guidance Philosophy

This document is a guide to typical air dispersion modeling techniques and procedures and generally expands on modeling procedures contained in the Environmental Protection Agency (EPA) *Guideline on Air Quality Models* (EPA, 1995a) (GAQM). The Modeling Section's goal is to use worst-case assumptions and conditions to conduct the minimum amount of modeling necessary to demonstrate that the modeled sources should not cause or contribute to a condition of air pollution.

If additional refinement is needed, then only the level of refinement necessary to achieve the modeling demonstration's objective is required. However, if one of the purposes of the modeling demonstration is to determine baseline impacts for an entire facility, for example as required for Standard Exemption 115, then the most refined analysis possible should be conducted.

These guidelines are not intended to be a "cookbook" approach to dispersion modeling. Modelers should apply these guidelines to each individual project due to the diversity of the state's topography and climate, and the variations in source configuration and operating characteristics.

However, these guidelines do suggest a minimum level of analysis that a modeler should follow so that modeling results clearly demonstrate that the public's health, general welfare, and physical property are protected. In addition, the TNRCC staff requires consistency in the selection and application of dispersion models to ensure a common basis for estimating pollutant concentrations, assessing control strategies, and specifying emission limits--without compromising accuracy.

The Modeling staff may approve techniques other than those recommended in this document if the modeler can demonstrate that they are more appropriate. This demonstration should be reviewed with the Modeling staff and documented in the applicant's air quality analysis.

Periodically, the Modeling staff develops new techniques, or changes its procedures to reflect improvements in regulatory models, to correct deficiencies that have been discovered, or to be consistent with requirements of other regulatory agencies. These changes to standard practices and other useful information will be placed on the TNRCC OnLine Bulletin Board System (BBS) as appropriate, usually as modeling memos. Procedures to access the system are contained in the *TNRCC OnLine User's Manual* (TNRCC, 1995b). To access the TNRCC OnLine:

- Telephone Number: (512) 239-0700 (1200-9600, 14.4K baud);
- Line Settings: 8 data bits, no parity, 1 stop bit, full duplex;
- Terminal Emulation: VT100, VT102, ANSI.

In the first call, the user provides registration information. The user has immediate full access to the BBS services.

2.0 The Air Quality Analysis Process

The air quality analysis is an evaluation of the potential impact of new or modified facilities or sources on the environment. The analyses are conducted for federal Prevention of Significant Deterioration (PSD) permits and state permit projects; PSD analyses are usually more detailed than those for state analyses.

The air quality analysis process may involve a number of TNRCC responsibility areas depending upon the complexity of the application and the potential impact of the associated facility or source on air quality. The Permits staff determines the need for modeling and the scope of involvement of other TNRCC staff. Therefore, the applicant should contact the Permits staff for guidance before involving other TNRCC staff in the air quality analysis process.

2.1 Permits Staff Coordination

The applicant should provide sufficient information to the Permits staff so that they are able to determine the need for regulatory modeling. Regulatory modeling is any air dispersion modeling requested by the Permits staff that is used in the permitting process.

2.2 Coordination With Other TNRCC Staff

Other TNRCC staffs that may be involved in the permitting process include, but are not limited to, the following:

- Permit Modeling Unit, Modeling Section, Air Quality Planning Division, for modeling guidance and technical review.
- Toxicology and Risk Assessment Section, Office of Air Quality, for Effects Screening Levels (ESLs) and other information required for a toxicological review.
- Customer Reports & Services, Information Resources Division, for Point Source Data Base (PSDB) retrievals.
- Emissions Inventory Section, Air Quality Planning Division, for correction of errors, if any, found in the PSDB.
- Data Management and Analysis Section, Monitoring Operations Division, for ambient air quality monitoring data and county attainment status.
- Quality Assurance Section, Monitoring Operations Division, for review of monitoring quality assurance plans.
- Legal Services Division, for legal opinions regarding interpretation of regulations, control of property, ambient air, etc.

2.3 Permit Modeling Unit Primary Responsibilities

Permit modeling unit (PMU) staff:

- Provide technical guidance for the modeling process to TNRCC staff, applicants, and the public.
- Review modeling performed by permit engineers or perform modeling in support of a permit application.
- Evaluate the technical quality of air quality analyses submitted by applicants to ensure that predicted concentrations accurately represent potential impacts, demonstrate compliance with federal and state regulations and state guidelines, and can be used by the TNRCC staff to determine if modifications to existing facilities or construction of new facilities would cause or contribute to a condition of air pollution.
- ** Help small business applicants meet modeling requirements needed to obtain a permit or perform modeling as necessary.

2.4 Modeling Request

** The permit engineer determines the need for air dispersion modeling and advises the applicant by letter to contact the PMU scheduler. The applicant or the applicant's modeler contacts the scheduler to discuss the project and pre-modeling requirements.

2.5 Modeling Staff Point of Contact

** The PMU scheduler is the point of contact for all modeling guidance requests. The scheduler collects required information and assigns the project to a modeler who will provide detailed guidance for the project. The modeler coordinates with the permit engineer and contacts the applicant to set up a time for a guidance meeting. There are two options for the guidance meeting: an in-person meeting with Modeling, Permits, and other applicable staff; or, for simple projects, a meeting by phone between a member of the PMU staff and the applicant's modeler.

2.6 Permit Modeling Guidance Meeting Checklist

The results of the meeting should be documented by a permit modeling guidance meeting checklist, or for complicated projects, a modeling protocol. Either document should be prepared by the applicant as much as possible before the meeting. The PMU modeler signs the checklist if it is complete or prepares the final checklist, which the applicant should include in the air quality analysis report. See Appendix E.

2.7 Prevention of Significant Deterioration (PSD) Protocol

** Guidance meetings for PSD projects are optional but may be combined with meetings for state permit applications. In place of a guidance checklist, the applicant's modeler prepares a PSD modeling protocol. The protocol serves as a checklist or outline of how the modeling should be conducted. PSD protocols should be submitted to the PMU scheduler. The scheduler assigns the protocol to one of the PMU staff who reviews the protocol and provides comments to the applicant before the applicant's modeler performs regulatory modeling. See Appendix D.

3.0 The Air Quality Analysis

The air quality analysis is an evaluation of the impact of increased emissions from new or modified sources on the environment based on the predicted concentrations obtained through modeling.

3.1 Levels of Modeling Used in The Air Quality Analysis

There are two levels of modeling sophistication used in the air quality analysis process--screening and refined. Modeling results from either level, as appropriate, may be used to demonstrate compliance with standards or guidelines.

3.1.1 Screening Modeling

The first level of sophistication involves the use of screening procedures or models. Screening models use simple algorithms and conservative techniques to indicate whether more detailed modeling is necessary.

Screening models are usually designed to evaluate a single source or sources that can be collocated (Section 3.3.2). Multiple sources can be modeled individually and then the maximum concentration from each source summed for an overall estimate of maximum concentration from the facility. This technique is conservative as the concentrations from each source are added without regard to distance.

The Permits staff generally conducts an initial screening analysis, or the staff may ask the applicant to conduct an analysis. The screening analysis should be consistent with guidance contained in the GAQM (EPA, 1995a), and appropriate screening modeling guidance documents, such as the *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources* (EPA, 1992a).

3.1.2 Refined Modeling

If the screening analysis results indicate that predicted concentrations from the evaluated facilities could exceed a standard, guideline, de minimis, or a staff-identified percentage of a standard or guideline, the Permits staff may determine that refined modeling is necessary. It is usually the applicant's responsibility to perform refined modeling. However, the Permits staff may ask the PMU staff to perform this type of modeling under certain circumstances, such as for small businesses that cannot afford the costs associated with refined modeling.

This second level of modeling requires more detailed and precise input data and more complex models in order to provide refined concentration estimates. The Industrial Source Complex model is used primarily, and is available for download from the EPA's Support Center for Regulatory Air Models (SCRAM) bulletin board system (BBS). The SCRAM BBS can be accessed via the EPA's Technology Transfer Network (TTN). To access the SCRAM:

- Telephone Number: (919) 541-5742 (1200-9600, 14.4K baud);

- Line Settings: 8 data bits, no parity, 1 stop bit;
- Terminal Emulation: VT100 or ANSI;
- Internet Address: TELNET ttnbbs.rtpnc.epa.gov.

In the first call, the user provides registration information. The user has immediate full access to the BBS services.

3.2 Types of Air Quality Analyses

The type of air quality analysis depends on the category of permit and pollutants to be evaluated. There are two categories of permits--state and federal. State permit types of analyses are property line, National Ambient Air Quality Standards (NAAQS), effects evaluation, and disaster review. Federal permits are known as Prevention of Significant Deterioration (PSD) permits and may include the following analyses: NAAQS, increment, monitoring, ozone ambient impact, additional impacts, and Class I area impacts. Please note that several types of analyses could be required for a single permit. Before conducting any analysis, a modeling emissions inventory must be developed.

3.3 Modeling Emissions Inventory

The modeling emissions inventory consists of the sources to be permitted, as well as other applicable on- and off-property sources, including exempt and grandfathered sources. If off-property sources should be included in the modeling demonstration, modeling parameters can be obtained from the agency's Point Source Data Base (PSDB) (Appendix H).

The PSDB is a computerized data base containing information about point and fugitive sources of air pollutants, as defined by TNRCC permit and exemption activities and emission inventory surveys. Standard retrievals have been developed to obtain required source information. Please note that the modeler should include all known sources, even if they are not found in the PSDB.

If the modeler finds errors in the PSDB retrieval (for example, incorrect stack parameters), then the modeler should notify the Emissions Inventory Section of all errors found and provide the needed corrections for any of the applicant's sources, if applicable.

3.3.1 Ratio Techniques

Since predicted ambient air quality impacts from a source are proportional to its emission rate, it may be appropriate to use a ratio technique to simplify the evaluation of on-property sources and/or reduce the number of pollutants requiring individual refined modeling runs to a manageable number. Please refer to Appendix B for a description of two ratio techniques. Other techniques may be approved on a case-by-case basis.

The modeler should document the applicability of the methods described in Appendix B in the modeling checklist, or protocol, and the air quality analysis.

3.3.2 Collocation of Emission Points

Regulatory modeling should reflect the actual characteristics of the proposed or existing sources. Therefore, emission points should not be collocated except in well-justified circumstances. For example, collocation may be appropriate when the number of sources at a large facility exceed the capability of the model. Modeling convenience or the desire to reduce model run time are not, by themselves, acceptable justifications.

Collocating fugitive emission points may be appropriate for a screening analysis. If so, then the modeler should collocate all emissions at the point located nearest to the property line or fence line for PSD analyses.

Collocating stacks may be appropriate for both screening and refined analyses if 1) the individual point sources emit the same pollutant(s), 2) the sources have stack heights, volumetric flow rates, or stack gas exit temperatures that do not differ by more than about 20 percent, 3) the sources are within about 100 meters of each other, and 4) the maximum distance between any two stacks is about the same as the distance between any stack and the closest receptor. Modelers can use the following equation (EPA, 1992a) to determine the worst-case stack:

o $$M = \frac{h_s V T_s}{Q}$$

Where:

- o M = a parameter that accounts for the relative influence of stack height, plume rise, and emission rate on concentrations;
- o h_s = the physical stack height in meters;
- o $V = (\pi/4)d_s^2 v_s$ = stack gas flow rate in cubic meters per second;
- o d_s = inside stack diameter in meters;
- o v_s = stack gas exit velocity in meters;
- o T_s = the stack gas exit temperature in Kelvin; and,
- o Q = pollutant emission rate in grams per second.

The stack that has the lowest value of M is used as a "representative" stack. The sum of the emissions from all stacks is assumed to be emitted from the representative stack; that is, the stack whose parameters resulted in the lowest value of M.

3.4 Preliminary Impact Determination

Each air quality analysis begins with a preliminary impact determination. Only sources related to the permit application are reviewed at this stage if there is a net increase in emissions. Emissions from all new equipment should be modeled, even if the emissions are released through existing emission points. For PSD permits, emissions increases and decreases over a contemporaneous 5 year period are evaluated to determine if there is a net emissions increase. ** For state permits, the emission increases and decreases directly associated with the permit application are evaluated to determine if there is a net emissions increase.

If the predicted high concentration from the modeled sources is significant, that is, it equals or exceeds de minimis or a staff-identified percentage of a standard or a guideline, then additional modeling is generally required. A determination is required for each applicable pollutant and averaging period.

For state NAAQS, PSD NAAQS, and PSD increment analyses, the preliminary impacts determination defines the project's area of impact (AOI). The AOI contains the receptors that equal or exceed de minimis for each pollutant and averaging period.

For the other types of analyses, if de minimis or a specified threshold is exceeded, then additional modeling is usually required. If no exceedances of these trigger levels are predicted, then the permitted sources do not make a significant impact and no further modeling is required.

Some of the possible modeling combinations for the preliminary impact determination are summarized as follows:

- New source: Model the proposed allowable emission rate.
- Modified source:
  - ** State: Model the difference between new allowable emission rate and the existing allowable emission rate.
  - PSD: Model the difference between the new allowable emission rate and the existing actual emission rate.
- Multiple sources used in netting with a resulting emissions increase:
  - ** State: Model sources with allowable emission rate increases as positive numbers and allowable emission rate decreases as negative numbers.
  - PSD: Model sources with allowable emission rate increases as positive numbers and actual emission rate decreases as negative numbers.

3.5 State Property Line Analysis

State property line analyses (also referred to as state regulation analyses) are performed for sources being permitted per: Regulation I (TNRCC, 1995c), Regulation II (TNRCC, 1992), and Regulation III (TNRCC, 1987). These regulations define property line standards for a number of pollutants for various averaging times.

Although the applicant should model all on-property sources, in many cases, the proposed emissions or changes in emissions may not be substantial when compared to the total emissions from the plant. Therefore, the standard procedure will be to first model the emissions from the proposed emission points as described in the Preliminary Impact Determination section (3.4). Often, if the predicted maximum off-property concentration is less than 2 percent of the standard, then no additional modeling should be necessary.

However, this procedure is applied on a case-by-case basis and may not always be appropriate. For example, in areas where monitoring has shown that a standard for a pollutant has been exceeded or where previous modeling has shown that the standard may be exceeded, all sources of the pollutant on the plant property should be modeled; that is, the "2 percent" de minimis does not apply.

If plant-wide modeling is required, the modeler determines predicted ground-level concentrations by modeling the allowable emission rates for all sources on the applicant's property that emit the regulated pollutant. For sources that do not have an allowable emission rate, the modeler should model actual emission rates.

Concentrations are predicted at locations at and beyond the property line. The modeler compares the maximum predicted concentration with the appropriate standard for each averaging time (Appendix A, Appendix G). ** If an exceedance is predicted, additional modeling, technical analyses, or monitoring may be appropriate.

Additional modeling may be conducted to reflect actual operating characteristics, such as batch operations, or special provisions such as limits to hours of operation or "bubble" allowable emission rate limits. Also, the applicant might demonstrate that air quality could be improved by issuance of the permit. For example, air quality could be improved by replacing an existing non-best available control technology (BACT) source at a facility with a proposed BACT source and associated plant-wide emissions decreases.

Additional technical analyses may include an evaluation of existing, representative monitoring data for a plant to demonstrate that the predicted maximum concentrations from a proposed source when added to monitored concentrations would not exceed a standard. Alternatively, since some standards are based on a fixed ambient temperature, a modeler could use the ideal gas law to convert parts per million (billion) to micrograms per cubic meter based on the modeled ambient temperature for the exceedance. For example, the 1021 micrograms per cubic meter ($\mu g/m^3$) concentration for SO_2 is based on the conversion of the 0.4 parts per million standard at an ambient temperature of 90 degrees Fahrenheit. At a lower temperature, the equivalent concentration in $\mu g/m^3$ would be higher, and the standard might not be exceeded.

If monitoring is an alternative, the TNRCC staff will help the applicant develop a monitoring plan.

3.6 State National Ambient Air Quality Standards (NAAQS) Analysis

State NAAQS analyses are performed for facilities being permitted with sources that emit the following criteria pollutants and do not trigger a PSD analysis: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxides (NO_x), lead (Pb), and particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}). For a new or modified source, compliance with any NAAQS is based upon the total estimated air quality, which is the sum of the maximum modeled source concentration plus a background concentration.

A modeler starts the modeling process with a preliminary impact determination to predict if the proposed source(s) could make a significant impact to existing air quality; that is, equal or exceed a NAAQS de minimis (Section 3.4). The NAAQS de minimis levels are specified in Appendix A. If the source makes a significant impact for a pollutant of concern, an AOI is defined and the modeler should then conduct a full NAAQS analysis.

The first step in the NAAQS analysis is to determine the radius of impact for the AOI for each pollutant subject to the NAAQS analysis. This radius is the farthest distance from the sources under review to the location where concentrations are predicted to equal or exceed de minimis for each applicable averaging time and pollutant. The largest radius for each pollutant--regardless of averaging period--is used for the rest of the analysis.

Next, the modeler obtains a retrieval using both primary and secondary radius search options from the Point Source Data Base (PSDB) (Appendix H). This retrieval identifies sources within the radius of impact and other sources outside the radius of impact which should be evaluated. Predicted concentrations from these sources along with the proposed sources should be determined over the AOI. The modeler should model allowable emission rates for all sources that emit the regulated pollutant. For sources that do not have an allowable emission rate, the modeler should use the actual emission rate. If any sources are omitted from the modeling demonstration, the modeler should discuss in the air quality analysis why they were omitted.

For comparison with the NAAQS, the modeler adds a background concentration to the predicted concentration at or beyond the fence line (Appendix A, Appendix G). As defined by the EPA, background air quality includes pollutant concentrations due to: natural sources, nearby sources other than the one(s) under consideration, and unidentified sources. Ambient air quality monitoring concentrations can be used to represent background concentrations, and can be obtained, if available, by contacting the TNRCC Data Management and Analysis Section, Monitoring Operations Division staff at (512) 239-1616. The modeler should contact the PMU staff if a background concentration is not available.

The modeler compares the combined concentration (predicted plus background) for each pollutant to the appropriate NAAQS. This concentration should be conservative since both nearby and distant background point sources are included in both the predicted and background concentrations. Therefore, if the combined value exceeds a NAAQS, then the background concentration should be refined to remove or limit the contributions from the background point sources. The PMU staff is developing guidance on how to obtain and use background concentrations. The staff will place the guidance on the TNRCC OnLine BBS when it is complete.

After the NAAQS analysis has been completed, the modeler may be required to conduct additional modeling if a predicted concentration will exceed a NAAQS and the permitted sources are predicted to make a significant impact at the same time and location of a NAAQS exceedance (TNRCC, 1995a).

3.7 ** State Effects Evaluation Analysis

State effects evaluation analyses (also known as health effects reviews) are performed for non-criteria pollutants.

The Toxicology and Risk Assessment Section (TARA) staff evaluate all pollutants. For many of these pollutants, TARA staff have determined ambient levels below which they do not expect adverse effects. These levels are referred to as Effects Screening Levels (ESLs) and are guidelines used to protect against adverse health and vegetation effects, damage to materials (such as corrosion), and nuisance conditions (such as odors).

The TARA staff provide ESLs for both short- and long-term periods. Short-term usually means 1 hour and long-term means annual. Occasionally, other short-term periods (such as 8-hour or 24-hour) are of concern. In those cases, TARA staff will provide the appropriate ESL to use. If a review of long-term impacts is required along with short-term impacts, long-term concentrations do not need to be obtained separately if the maximum short-term concentration is lower than the corresponding long-term ESL. For example, no long-term modeling would be required if the pollutant's short- and long-term ESLs were 10 and 1 $\mu g/m^3$, respectively, and the maximum short-term concentration was less than 1 $\mu g/m^3$.

Modelers should consult with TARA staff to ensure that the most recent ESL list is used, to obtain additional information concerning the basis for ESLs, or to obtain ESLs for pollutants not on the published list. Currently, this list is updated every April. For pollutants not on the published list, applicants should provide the chemical abstract service (CAS) registry number and a material safety data sheet (MSDS) to the staff so that they can positively identify the pollutant and derive an ESL. The applicant should keep in mind that if numerous pollutants are submitted it may take some time to determine appropriate ESLs.

In addition, applicants should follow the *Modeling and Effects Review Applicability Guidance Document for Non-Criteria Pollutants* (Revised) (TNRCC, 1994) to determine what type of modeling demonstration will be required. Often, if there will be large plant-wide emission reductions or if the proposed source will have less than de minimis impact, plant-wide modeling may be waived.

If plant-wide modeling is required, the modeler determines predicted ground-level concentrations at and beyond the property line by evaluating the allowable emission rates for all sources on the applicant's property that emit the permitted pollutant. For sources without allowable emission rates, the modeler should model actual emission rates.

The effects evaluation is a three-tiered process. In the first tier, if the maximum off-property short- and long-term concentrations do not exceed the ESLs for the pollutant under review, then the impact is acceptable. If not, further evaluation is required.

In the second tier, for a pollutant whose predicted concentration exceeds either a health-based or odor-based ESL, the following conditions must be addressed:

- The maximum off-property concentration occurs on industrial-use property, or on other property which is not expected to be used by the public and does not exceed the ESL by more than twice, and

- The concentration at any nonindustrial receptor is less than or equal to the ESL.

The impact is acceptable if both conditions are met. If not, further evaluation is required.

While the first two tiers are based on predicted concentrations, the third tier incorporates additional case-specific factors which relate to the exposure scenario and resultant toxicity of emissions. These factors include surrounding land use; magnitude of the concentration exceeding the ESL; frequency of exceedance; existing levels of the same pollutant; type of toxic effect caused by the pollutant; the margin of safety between the ESL and known effect levels; degree of confidence in the toxicity database; and acceptable reduction from existing impacts.

To assist TARA staff with their second and third tier technical review, the modeler should include gridded maps in the air quality analysis that depict:

- Maximum concentrations at each receptor on the grid;

- The magnitude of the ESL exceedance (concentration divided by ESL) at each receptor with a predicted exceedance;

- The number of times the ESL is predicted to be exceeded at each receptor; and,

- The location of sensitive receptors such as the nearest resident or receptors of interest for hazardous waste permits.

3.8 ** State Disaster Review

Permit applications for certain chemicals require information necessary for an assessment of disaster potential.

The Permits staff may ask the applicant to conduct a disaster review if the applicant or permit engineer identifies a potential for a catastrophic release of any applicable pollutant. This disaster review may include disaster modeling. The need for disaster modeling and the determination of release scenarios to be modeled will be developed on a case-by-case basis by the Permits staff. Disaster Review Guidelines are included in the TNRCC Form PI-1 Permit Application Instructions.

If the Permits staff determines that disaster modeling is necessary, then the applicant should work closely with the PMU staff to select an appropriate disaster release model.

3.9 PSD NAAQS Analysis

The PSD NAAQS analysis is similar to the state NAAQS analysis but there are differences. More detailed guidance for these analyses is contained in the EPA *Draft New Source Review Workshop Manual* (EPA, 1990). Note that the term "de minimis" in Regulation VI (TNRCC, 1995a) and the phrase "significance level" (EPA, 1990) are synonymous.

PSD NAAQS analyses are performed for major sources and major modifications to sources that emit criteria pollutants. If a criteria pollutant's de minimis is equaled or exceeded for new or modified sources, a NAAQS analysis is required within the AOI.

In addition, there are selected non-criteria pollutants that must be reviewed. The analysis for these pollutants is similar to the NAAQS. However, since there are no federal de minimis levels for non-criteria pollutants, PMU modelers will use appropriate de minimis or threshold levels for state property line or effects evaluation analyses to develop impact analysis requirements, including the definition of the AOI.

A modeler starts the modeling process with a preliminary impact determination to predict if the proposed source(s) could make a significant impact to existing air quality; that is, equal or exceed a NAAQS de minimis (Section 3.4). The NAAQS de minimis levels are specified in Appendix A. If the source makes a significant impact for a pollutant of concern, an AOI is defined and the modeler should then conduct a full NAAQS analysis.

The first step in the NAAQS analysis is to determine the radius of impact for the AOI for each pollutant subject to the NAAQS analysis. This radius is the farthest distance from the sources under review where concentrations are predicted to equal or exceed de minimis for each applicable averaging time and pollutant. The largest radius for each pollutant regardless of averaging period is used for the rest of the analysis. This radius is limited to the actual distance or 50 kilometers, whichever is less.

Next, the modeler obtains a primary retrieval from the PSDB (Appendix H). The primary retrieval is made for the radius of impact plus 50 kilometers and identifies sources that could cause a significant impact within the AOI. Predicted concentrations from these sources along with the proposed sources should be determined over the AOI. The modeler may eliminate off-property sources from the modeling demonstration if the sources' contributions would not equal or exceed the applicable de minimis.

The modeler should model allowable emission rates for all sources that emit the regulated pollutant. For sources that do not have an allowable emission rate, the modeler should use the actual emission rate. If any sources are omitted from the modeling demonstration, the modeler should discuss in the air quality analysis why they were omitted.

For comparison with the NAAQS, the modeler adds a background concentration to the predicted concentration at or beyond the fence line (Appendix A, Appendix G). As defined by the EPA, background air quality includes pollutant concentrations due to: natural sources, nearby sources other than the one(s) under consideration, and unidentified sources. Ambient air quality monitoring concentrations can be used to represent background concentrations, and can be obtained, if available, by contacting the TNRCC Data Management and Analysis Section, Monitoring Operations Division staff at (512) 239-1616. The modeler should contact the PMU staff if a background concentration is not available.

The modeler compares the combined concentration (predicted plus background) for each pollutant to the appropriate NAAQS. This concentration should be conservative since both nearby and distant background point sources are included in both the predicted and background concentrations. Therefore, if the combined value exceeds a NAAQS, then the background concentration should be refined to remove or limit the contributions from the background point sources. The PMU staff is developing guidance on how to obtain and use background concentrations. The staff will place the guidance on the TNRCC OnLine BBS when it is complete.

After the NAAQS analysis has been completed, the modeler may be required to conduct additional modeling if a predicted concentration will exceed a NAAQS, and the permitted sources are predicted to make a significant impact at the same time and location of a NAAQS exceedance (EPA, 1990; TNRCC, 1995).

3.10 PSD Increment Analysis

A PSD increment is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant. The amount of PSD increment that has been consumed in a PSD area is determined from the emissions increases and decreases which have occurred from sources since the applicable baseline date. An applicant does not need to determine the baseline concentration to determine the amount of PSD increment consumed or the amount of increment available. Instead, increment consumption calculations reflect the ambient pollutant concentration change attributable to increment-affecting emissions.

Increment consumption (or expansion) is based on changes in actual emissions reflected by normal source operation for a period of 2 years. However, if little or no operating data is available, as in the case of permitted sources not yet in operation at the time of the increment analysis, the permit allowable emission rate must be used.

An increment analysis is required if a predicted concentration for new or modified sources of nitrogen oxides, sulfur dioxide, or particulate matter with an aerodynamic diameter of 10 microns or less exceeds the pollutant's de minimis (Section 3.9). The modeler includes all on-property and off-property sources within the area of impact plus 50 kilometers that affect increment in the modeling demonstration. The modeler compares concentrations at and beyond the fence line to the pollutant's increment.

The first step in the increment analysis is to determine the radius of impact for each pollutant that had an AOI defined in the NAAQS analysis (Section 3.9). The radius of impact will be the same one used in the NAAQS analysis.

Next, the applicant obtains a primary retrieval of increment affecting sources from the PSDB (Appendix H). Concentrations from these sources along with the sources to be permitted should be determined over the AOI. The applicant may choose to eliminate off-property sources from the modeling if the sources' contributions would not equal or exceed the applicable de minimis used in the NAAQS analysis. If any sources are omitted from the modeling demonstration, the modeler should discuss in the air quality analysis why they were omitted.

Increment consumption (or expansion) calculations should be based on the difference between the existing actual emission rate and the baseline date actual emission rate. Actual is defined as the most recent, representative 2-year average for long-term rates, or the maximum short-term rate in the 2-year period.

For sources where a change in actual emission rates involved a change in stack parameters, use the emission rates associated with both the baseline and the existing situation. That is, enter the baseline emission rates as negative numbers along with the baseline source parameters and enter the existing emission rates for the same source as positive numbers along with the existing source parameters. If proposed sources are involved, use proposed allowable emission rates for the "existing" situation.

** Since the actual emission rates in the PSDB do not meet the EPA criteria, the modeling staff developed a tiered approach to assist the modeler.

- First, model all sources using their PSDB allowable emission rates. Allowable emission rates are used because the actual emission rates are not calculated according to PSD guidelines. This approach is conservative since the "difference" in increment is the entire allowable emission rate. Compare the predicted concentration to the appropriate increment (Appendix A, Appendix H). If the increment is not exceeded, the demonstration is complete. Otherwise, go to the second tier.

- Second, model selected sources with 2-year average actual emission rates and all other sources with allowable emission rates. The selected sources are usually the applicant's, since actual emission rates may be difficult to obtain for off-property sources. This assumes that the "difference" in increment for the selected sources is the entire actual emission rate. If the increment is not exceeded, the demonstration is complete. Otherwise, go to the third tier.

- Third, model selected sources with the "difference" between the current 2-year actual emission rate and the 2-year actual emission rate as of the baseline date. In addition, use emission rates found in the first or second tier as applicable. If the increment is not exceeded, the demonstration is complete. Otherwise, the modeler must continue to refine increment emission rates or demonstrate that the source's impact will not be significant (EPA, 1990).

3.11 PSD Monitoring Analysis

If the PSD NAAQS de minimis is exceeded for new or modified sources of criteria pollutants, a monitoring analysis is required to determine if preconstruction monitoring may be required. This analysis is also required for selected non-criteria pollutants.

The monitoring analysis begins with a comparison of the AOI modeling concentrations to the monitoring significance level for the pollutant of interest. Preconstruction monitoring is usually required if the monitoring significance level is exceeded; however, this requirement can be waived under certain conditions.

3.11.1 Pre-Construction Monitoring Exemptions

The Permits staff, in coordination with PMU staff and Monitoring Operations staff, has discretionary authority to exempt an applicant from this data requirement under the following conditions:

- The sources under review are modeled. If the predicted concentrations for the appropriate averaging periods are below the monitoring significance levels shown in Appendix A, a monitoring exemption can be granted.

- If the sources under review cannot meet the exemption requirement, then the modeler requests a NAAQS primary and secondary retrieval from the PSDB (Appendix H). All sources identified in the retrieval are evaluated over the area where the sources under review make a significant impact--the same AOI as defined in the NAAQS analysis (Section 3.9). The sources under review are not included. If the predicted concentration is below the monitoring significance level defined in Appendix A, an exemption can be granted.

- As an alternative to modeling, the applicant can supply data from an existing monitoring network. Data from state monitors can be obtained from the Data Management and Analysis

Section, Monitoring Operations Division staff at (512) 239-1616. If these concentrations meet EPA requirements for representativeness, then an exemption may be granted.

Note, however, that pre- and post-construction monitoring could be required if a potential threat to the NAAQS is identified by modeling predictions. A threat is defined in the *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* (EPA 1987a), as 90 percent of the NAAQS or PSD increment.

3.11.2 Monitor Siting and Monitoring Quality Assurance (QA) Plan

If existing data are not available, or are judged not to be representative, then the applicant should establish a site-specific monitoring network. The applicant should follow the guidance in the *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* (EPA, 1987a) and the *On-Site Meteorological Program Guidance for Regulatory Modeling Applications*, (EPA, 1987b) to determine potential locations for monitoring sites. In addition, the applicant should contact the Quality Assurance Section, Monitoring Operations Division staff for assistance in the preparation of a monitoring QA plan (512) 239-1801.

3.12 PSD Ozone Ambient Impact Analysis

An ozone ambient impact analysis is required if new or modified sources have a net increase of 100 tons-per-year or more of volatile organic compounds (VOCs). The PMU staff determines the type of analysis on a case-by-case base. This analysis may require pre-construction monitoring to obtain representative ambient concentrations, and reactive plume modeling to predict the proposed facility's impact on ambient air quality.

3.13 PSD Additional Impacts Analysis

The additional impacts analysis consists of a growth analysis, a soil and vegetation analysis, and a visibility impairment analysis. Modeling results from the NAAQS analysis can usually be used in the first two parts of the additional impacts analysis. However, additional modeling for the visibility impairment analysis that follows the *Workbook for Plume Visual Impact Screening and Analysis* (EPA, 1992a) or *User's Manual for the Plume Visibility Model (PLUVUE II)* (EPA, 1992c) is necessary. This requirement is in addition to any visibility analysis required for Class I areas, and is applicable for the area of impact defined in the NAAQS analysis.

3.13.1 Visibility Analysis For Class II Areas

The PMU staff is developing guidance on how to conduct visibility analyses for Class II areas. The staff will place the guidance on the TNRCC OnLine BBS when it is complete.

3.14 PSD Class I Impact Area Analysis

The PSD regulations provide special protection for Class I areas. Class I areas are deemed to have special natural, scenic, or historic value. Class I analyses involve the Federal Land Manager (FLM) as a participant in the permit review process. A Class I analysis is required for PSD sources that locate within 100 kilometers (km) of a Class I area. In addition, a Class I analysis may be required if the sources will be located more than 100 km away, if there is concern that the emissions could adversely affect the Class I area. The only Class I areas in Texas are Big Bend National Park and Guadalupe Mountains National Park. However, other Class I areas in adjacent states, for example, Carlsbad Caverns National Park, New Mexico, could trigger a Class I analysis.

The air dispersion modeling requirements for Class I areas include more stringent PSD increments, air quality-related values (AQRVs), and visibility impairment analysis. Due to the fact that PSD Class I analyses are rare in Texas, the reader should refer to the *Draft New Source Review Workshop Manual* (EPA, 1990) Chapter E for procedural and technical guidance, as well as the applicable Class I increments.

4.0 Acceptable Dispersion Models

In general, modelers should use the models and follow the modeling procedures identified in the GAQM (EPA, 1995a). Although the GAQM was developed to address PSD and State Implementation Plan modeling, the PMU staff applies the general guidance contained in the GAQM to other modeling demonstrations in order to maintain a consistent approach for all projects.

The GAQM lists preferred air quality models in GAQM Appendix A and lists models that may be considered on a case-by-case basis in GAQM Appendix B. Occasionally, it may be appropriate to use models which are not specified in the GAQM; for example, disaster models and other models, such as the Toxic Modeling System Short Term (TOXST). To use these models, the modeler should demonstrate that no GAQM Appendix A model is appropriate for the required modeling analysis. The most recent version of each model should be used in all cases. Guidance on demonstrating the need for non-Appendix A or non-GAQM models is found in Section 3.2.2 of the GAQM.

Modelers should not use the Texas Climatological Model (TCM) or the Texas Episodic Model (TEM), which are currently included in GAQM Appendix B, or any other Texas models that may have been used in the past (including Model 2 and Model 4) for modeling evaluations submitted to the TNRCC.

The Industrial Source Complex Short Term (ISCST), the Industrial Source Complex Long Term (ISCLT) and the SCREEN models are the most commonly used models for state and PSD modeling in Texas. These models can be used to assess the impacts from point, area, and volume sources, and can incorporate the effects of building wakes upon plumes (building downwash). Since ISCST and ISCLT are the most commonly used refined models, much of the following discussion applies to these models.

The ISCST model can be used to obtain short-term concentrations for multiple averaging periods simultaneously. Short-term is defined as any time period less than or equal to 24 hours. ** The worst-case short-term emission rate may be used for all short-term averaging periods. This is a conservative approach since the emission rate for the shortest time period will equal or exceed emission rates for subsequent time periods. For example, the 1-hour emission rate can be used to predict 3- and 24-hour concentrations.

The ISCST model can be used to obtain long-term concentrations as well. ** If an evaluation is required for a pollutant that has both short-term and annual standards or guidelines, the period option in the ISCST model can be used to obtain annual average concentrations. This is a conservative approach since short-term emission rates can be equal to but are usually higher than long-term emission rates.

These approaches may not be applicable in cases where the worst-case short-term emission rate results in unrepresentative concentrations for some averaging periods. In those cases, the short-term model may be used with the appropriate emission rate for the period being evaluated.

For example, the ISCST model may be run separately with a 1-hour emission rate to obtain 1-hour concentrations, and run again with an annualized average hourly emission rate to obtain annual concentrations, etc.

The GAQM suggests that the ISCLT model should be used for modeling evaluations conducted for pollutants that have only long-term standards [currently, nitrogen dioxide (NO_2) and lead (Pb)]. However, the ISCST model may be used under certain conditions. ** For Pb, refer to the Pb modeling memo on the TNRCC OnLine BBS--modeling is more complicated because Pb has a quarterly standard instead of an annual standard. ** For NO_2, the following procedure can be used in conjunction with the ratio technique identified in Appendix B:

- For PSD applications, select the Period option and run the ISCST model separately for each of 5 years of meteorological data (Section 5.6.1).

- For State applications, select the Period option and run the ISCST model with the appropriate state year of meteorological data. If the maximum predicted concentration is less than 75 percent of the appropriate de minimis or standard no further modeling is needed. Otherwise, run the model for each of 5 years of meteorological data, to ensure that a representative maximum concentration is identified (5.6.1).

Acceptable models for complex terrain are discussed in the GAQM Section 5.0. These are essentially screening models. The Valley model is incorporated into the SCREEN model and the Complex I model is incorporated into the ISCST model. Use of screening models is sufficient unless exceedances of a standard or increment are predicted; then a refined model may be used. Use of a refined complex terrain model, such as CTDMPLUS, requires extensive meteorological information which must be collected over a 1-year period. The modeler should contact the PMU staff to discuss complex terrain modeling as applicable.

4.1 Distance Limitations

The GAQM indicates that the useful distance for guideline models is 50 kilometers. Occasionally, some sources may be located beyond 50 kilometers from portions of the AOI. When this occurs, the modeler should model these sources unless the modeler can demonstrate that the contribution from these sources would be insignificant. Modeled impacts from sources beyond 50 kilometers are conservative estimates that may provide an indication of a threat to the NAAQS.

4.2 Modification of Models

The EPA has established procedures to request changes to model algorithms. Applicants should submit requests with suggested changes to model source codes to EPA with a copy to the PMU staff.

The internal source codes for regulatory models should not be modified in a manner that would change the basic algorithms used by the model to calculate ground-level concentrations without

PMU staff review and comment. Minor modifications unrelated to model algorithms, such as re-dimensioning of source or receptor arrays, do not require PMU staff coordination.

Substantial pre- or post-processor programs or subroutines should be documented and submitted to the PMU staff. For example, a program used to calculate downwash parameters for entry into the ISC models is a substantial pre-processor program. An example of a substantial post-processor program would be one that is used to count the number of exceedances at each receptor for the appropriate averaging period.

5.0 Model Control Parameters and Entry Data

The regulatory default option should always be selected unless the PMU staff approves the use of other parameters. This option is defined in the *User's Guide for the Industrial Source Complex (ISC) Dispersion Models*, (EPA, 1995d) (ISC User's Guide), and other GAQM Appendix A model user's guides.

5.1 Urban Versus Rural Dispersion Options

The classification of the land use in the vicinity of sources of air pollution is needed because dispersion rates differ between urban and rural areas. In general, urban areas cause greater rates of dispersion because of increased turbulent and buoyancy-induced mixing. This is due to the combination of greater surface roughness caused by more buildings and structures, and greater amounts of heat released from concrete and similar surfaces.

EPA guidance provides two procedures to determine whether the character of an area is predominantly urban or rural. One procedure is based on land-use typing and the other is based on population density. Both procedures require an evaluation of characteristics within a 3-kilometer radius from a source. The land-use typing method is based on the work of August Auer (Auer, 1978), and is preferred because it is more directly related to the surface characteristics of the evaluated area that affect dispersion rates.

** While the Auer land-use typing method is more direct, it can be labor-intensive to apply. A simplified technique referred to in the hazardous waste combustion screening approach contained in the Code of Federal Regulations (CFR) Title 40, Part 266, Appendix IX, Section 6.0 (40 CFR, 266) can be used as a screening tool. If the land-use designation is clear, that is about 70 percent or more of the total land use is either urban or rural, then further refinement is not required.

5.1.1 Simplified Auer Land-Use Analysis

The Auer land-use approach considers four primary land-use types: Industrial (I), Commercial (C), Residential (R), and Agricultural (A). Within these primary types, subtypes are identified in Table 5-1.

Table 5-1
Land-Use Types And Corresponding Dispersion Classification

Type	Description	Class
I1	Heavy Industrial	Urban
I2	Light/Moderate Industrial	Urban
C1	Commercial	Urban
R1	Common Residential (Normal Easements)	Rural
R2	Compact Residential (Single Family)	Urban
R3	Compact Residential (Multi-Family)	Urban
R4	Estate Residential (Multi-Acre)	Rural
A1	Metropolitan Natural	Rural
A2	Agricultural	Rural
A3	Undeveloped (Grasses/Weeds)	Rural
A4	Undeveloped (Heavily Wooded)	Rural
A5	Water Surfaces	Rural

The goal in a land-use analysis is to estimate the percentage of the area within a 3-kilometer radius of the source to be evaluated that is either urban or rural. Both types do not need to be evaluated, since the type that has the greatest percentage will be the representative type.

The most difficult evaluation involves the residential types depicted in the table. The degree of resolution between subtypes for residential areas often cannot be determined without conducting a site area inspection and referring to zoning maps and aerial photographs. The Auer land-use typing process can require extensive analysis which, for many applications, can be greatly streamlined without sacrificing confidence in the selection of a representative land-use type.

The primary assumption for the simplified procedure is based on the premise that many facilities should have clear-cut urban or rural designations; that is, the percentage of the primary designation should be greater than about 70 percent. The color coding on United States Geological Survey (USGS) 7.5 minute topographic maps provides an effective means of simplifying the typing scheme. The suggested typing designations for the color codes found on the maps are:

- Blue - water (rural);
- Green - wooded areas (rural);
- White - parks, unwooded, nondensely packed structures (rural);
- White - industrial; identified by the large buildings, tanks, sewage disposal or filtration plants, rail yards, roadways, intersections (urban);
- Pink - densely packed structures (urban); and,
- Red - roadways, intersections (urban).

A modeler can use the simplifying approach if the topographic map is within 3 years old, or is older but still considered representative; and the land-use designation represents about 70 percent of the total.

If the land-use designation represents less than 70 percent of the total, a modeler may supplement the topographic map analysis with a current aerial photograph of the area surrounding the permitted sources, or with a detailed drive-through summary, to support the land-use designation to be used in the modeling demonstration.

5.1.2 Multiple Modeling Technique

** Alternatively, a screening modeling technique may be used in place of the land-use analysis. In this technique, the modeler runs the screening model twice, once for each dispersion option, and uses the higher of the two modeled results. If refined modeling is required though, the modeler may need to perform the Auer land-use analysis to determine the appropriate dispersion option. The modeler can evaluate the need for this level of detail on a case-by-case basis. This extra detail would not be needed if predicted concentrations from both refined model runs are below the value of concern for the modeling demonstration. However, if predicted concentrations exceed the value from either refined model run or the location, frequency and magnitude of the exceedance is of concern, then this extra effort is needed. Depending upon the source configuration and dispersion coefficient selected, the dispersion pattern and predicted concentrations could be significantly different and adversely affect the staff's technical review.

5.2 Terrain

Much of Texas can be characterized as having relatively flat terrain; however, some areas of the state have simple-to-complex terrain. The PMU staff defines flat terrain as terrain equal to the elevation of the stack base; simple terrain as terrain lower than the height of the stack top; and, complex terrain as terrain above the height of the plume center line (for screening purposes, complex terrain is terrain above the height of the stack top). Terrain above the height of the stack top but below the height of the plume center line is known as intermediate terrain. A modeler should evaluate the geography near each facility to determine how terrain elevations should be addressed. Measurements of the terrain in the area surrounding the facility should be made using USGS 7.5 minute topographic maps, or their digital equivalents.

Incorporating terrain is generally not a consideration when modeling releases from fugitive sources, because these releases are typically neutrally buoyant, with no plume rise to consider, and are essentially ground-level releases. Maximum concentrations from fugitive releases are thus expected to occur at the nearest downwind receptor location. Modelers should consider terrain near a property or fence line, though, for elevated fugitive releases.

** For refined modeling with the ISCST model, the modeler should use both the simple and complex terrain calculation options if other than flat terrain applies. That is, if the modeler puts terrain elevations for receptors into the model, both simple and complex options should be activated. In cases where multiple sources with varying heights of emission must be evaluated, the ISCST model rather than the SCREEN model should be used. Since the SCREEN model can only evaluate one source at a time, combined results for sources in intermediate-to-complex terrain might not be representative.

5.3 Variable Emission Rate Option

** When sources can operate only during specified hours, the modeler may use the variable emission rate option to restrict the modeling analysis to the hours of operation only. If this option is used, permit conditions should restrict the operation of the permitted source to the time period modeled.

The variable emission rate option may also be used to simulate other operating scenarios as necessary to design permit conditions.

5.4 Building Wake Effects (Downwash)

Modeling of point sources with stack heights that are less than good engineering practice (GEP) stack height should consider the impacts associated with building wake effects (also referred to as downwash). Building wake effects are not considered for area or volume sources.

As defined by the *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations)* (EPA, 1985), GEP height is calculated as:

$$GEP = H_b + 1.5L,$$

where H_b is the building height and L is the lesser of the building height or maximum projected width. This formula defines the stack height above which building wake effects on the stack gas exhaust may be considered insignificant.

A building or structure is considered sufficiently close to a stack to cause wake effects when the minimum distance between the stack and the building is less than or equal to five times the lesser of the height or projected width of the building (5L). This distance is commonly referred to as the building's "region of influence." If the source is located near more than one building, each building and stack configuration should be assessed separately.

If a building's projected width is used to determine 5L, the apparent width of the building must be determined. The apparent width is the width as seen from the source looking towards either the wind direction or the direction of interest. For example, for short-term modeling, the ISCST model requires the apparent building widths (and also heights) for every 10 degrees of azimuth around each source.

To account for downwash, the SCREEN model requires the entry of a building--or structure-- height and the respective maximum and minimum horizontal dimensions. Generally, to evaluate the greatest downwash effects for each source, the building with dimensions that result in the highest GEP stack height for that source should be modeled.

** The modeler should be aware that when screening tanks, the tank diameter should not be used. The SCREEN model uses the square root of the sum of the individual squares of both the width and length for a structure in order to calculate the projected width. Because most tanks are round, the projected width is constant for all flow vectors. However, using the actual tank diameter for both width and length will result in a projected width that is too large. So, when screening tanks, a modeler should divide the diameter of the tank by the square root of 2.

The ISC models also contain algorithms for determining the impact of downwash on ambient concentration, and should be used for determining refined concentrations estimates. Methods and procedures for determining the appropriate entries to account for downwash are discussed in the EPA's GEP guidance document (EPA, 1985). Due to the complexity of GEP guidance, the EPA has developed a computer program for calculating downwash parameters for use with the ISC models. This program is called the Building Profile Input Program (BPIP) (EPA, 1993), and is available from the SCRAM BBS.

The modeler should use the most current version of the BPIP to determine downwash parameters for use with the ISC models. In addition, there are several consultants who have developed more user-friendly computer programs to implement the BPIP guidance and a modeler can use these programs to determine downwash parameters. If these programs are used, however, the modeler should submit the program documentation to assist the PMU staff in the technical review process, unless the PMU staff has acquired the documentation previously.

5.5 Receptor Grid

A modeler should place receptors to determine the maximum ground-level concentration in an off-property area or an area not controlled by the applicant. If an AOI has been defined, receptors should cover the entire area of de minimis impact.

5.5.1 Receptor Spacing

Modeling with one or more of the following sets of receptors is suggested:

- Tight Receptors: Receptors spaced 25 meters apart. Tight receptors could extend up to 500 meters from the property or fence line. A receptor spacing of 25 meters should be used for the following cases:

  Sources with heights less than 15 meters and not affected by building downwash.

  Sources with heights less than 50 meters and affected by building downwash.

- Fine Receptors: Receptors spaced 100 meters apart. Fine receptors could extend 1 kilometer from each source being modeled.

- Medium Receptors: Receptors spaced 500 meters apart. Medium receptors could cover the area that lies between 1 and 5 kilometers from each source.

- Coarse Receptors: Receptors spaced 1 kilometer apart. This spacing could cover the area that lies beyond the medium receptors out to 50 kilometers.

5.5.2 Receptor Grid Design

The receptor grid should be designed by taking into consideration such factors as the results of screening analyses; a source's release height; the proximity of emission points, fugitive areas, and other sources to the property line; the location of nearest residents and other sensitive receptors and monitors; and, topography, climatology, etc. Generally, the spacing of receptors increases with distance from the sources being evaluated.

The use of coarse-grid spacing to determine a "hot spot," the suspected area of the maximum concentration, followed by the use of a tighter grid spacing to "zero" in on the maximum concentration, is generally not appropriate. For example, if the highest concentration were predicted to occur to the east of a source and the next highest concentration to the west, it would not be appropriate to ignore the area to the west. However, if an area has predicted concentrations several orders of magnitude higher than any other areas, it may be appropriate to focus on that area and ignore the others.

Tight receptors should cover a large enough area to demonstrate that the maximum predicted concentration has been located. The extent of the tight receptor grid should be determined on a case-by-case basis. Tight receptors may be required as far as 500 meters from the sources being evaluated, depending upon the emission release heights.

When multiple sources are modeled, the most restrictive of the suggested types of spacing should be used in order to determine representative concentrations from each source type. For example, in order to determine the overall maximum predicted concentration and location for a mix of tall and short sources, it may be necessary to extend the grid several kilometers away from the property line to identify concentrations related to tall stacks. It is appropriate to use a smaller receptor spacing located close to the property line to identify concentrations caused by short stacks or fugitive sources.

In addition, the location of "ambient" air receptors should guide the design of the receptor grid. Ambient air for state modeling starts at the applicant's property line. However, for PSD modeling, ambient air starts at the applicant's fence line or other physical barrier to public access. Also, no receptors are required on the applicant's property because the air over an applicant's property is not ambient; therefore, in a regulatory sense, an applicant cannot cause a condition of air pollution from sources on the applicant's property.

5.5.3 Coordinate System

Modelers should enter receptor locations into dispersion models in UTM coordinates, in order to be consistent with on- and off-property emission point locations represented in the Table 1(a) and PSDB, and other reference material, such as USGS topographic maps. A utility program to convert latitude and longitude to UTM coordinates is available on the EPA's SCRAM BBS. Applicable UTM zones in Texas are either 13 (from the west border to 102 degrees longitude), 14 (between 102 and 96 degrees longitude), or 15 (east of 96 degrees longitude to the east border).

Please note that coordinate systems based on plant coordinates or other applicant-developed coordinate systems should not be used. Also, polar grids should not be used unless the PMU staff suggests their use, such as for multi-pathway risk assessment analyses.

5.5.4 Special Receptor Spacing

Additional modeling should be conducted using receptors with a spacing of 50 meters in the vicinity of each receptor where a predicted concentration exceeds 75 percent of an applicable standard or guideline, if the initial receptor spacing was larger than 50 meters. At least a three-by-three receptor grid is recommended.

5.5.5 ** Receptor Elevations

If other than flat terrain is modeled, the modeler should use appropriate receptor elevations. Flat terrain is defined as terrain that is equal to the elevation of the stack base. Conservative options can be used though, to reduce the effort of determining specific receptor heights for dense grid networks. For example:

- o The highest elevation for any receptor in the grid could be used for all receptors in the grid.
- o Receptors with elevations below stack base can be set to zero or the FLAT terrain height keyword in ISC chosen which will cause the model to ignore terrain heights.

A modeler should be aware that if worst-case terrain heights are used with coarse grids, and more refined heights are used on progressively denser grids (medium, fine, tight), the modeled concentrations could decrease as the heights decrease.

5.5.6 ** Cavity Calculations

Occasionally, refined models cannot predict concentrations at receptors within an off-property cavity region of a source subject to downwash. In these cases, other approved models, such as the SCREEN model, could be used to determine representative concentrations for these receptors. The decision to determine concentrations at these receptors should be made after consideration of such factors as the source's probable contribution to the predicted concentration, the contribution from other sources, and the location of receptors. The modeler should document the method chosen to conduct the evaluation, as well as the results, in the air quality analysis.

5.5.7 ** Concentration Maps

The air quality analysis should include gridded concentration maps which demonstrate that the maximum predicted concentration has been found. The modeler can use isopleths rather than actual concentration plots if the presentation shows that concentrations are clearly decreasing away from the sources being modeled. When isopleths are used, the maximum off-property concentration must be clearly identified in the report and modeling output files.

5.6 Meteorological Data

The PMU staff has prepared meteorological data sets for state modeling analyses. These data sets are available for download from the TNRCC OnLine Bulletin Board System (BBS). The PMU staff's goal is to also obtain and process meteorological data sets for PSD modeling analyses. The staff will place these sets on the OnLine BBS as they are completed. The applicant is responsible for obtaining and preparing any required meteorological data not available from the OnLine BBS.

For PSD permit applications, some unprocessed meteorological data are available on the EPA's SCRAM BBS. Data not available on the SCRAM may be obtained from the National Climatic Data Center (NCDC). Data may be processed using the PCRAMMET (EPA, 1995e) program. In addition, on-site meteorological data may be used if appropriate and if obtained in accordance with EPA guidance (EPA, 1987b). Certain complex terrain models, such as CTDMPLUS, require on-site meteorological data.

For the commonly used ISC models the PMU staff can provide guidance on meteorological data processing and input options including mixing height, temperature, and anemometer height.

5.6.1 Short-Term Meteorological Data

Short-term meteorological data includes standard hourly surface and upper-air observations. These observations must be processed before they can be used in regulatory models (EPA, 1994; EPA, 1995e). For state permit applications, data for 1988 or 1989 should be used as specified in Appendix C. For PSD demonstrations, the modeler should process and use the most recent, readily available five years of data available on the SCRAM BBS, unless the PMU staff has placed processed data sets on the OnLine BBS.

5.6.2 Long-Term Meteorological Data

Long-term meteorological data includes joint frequency distributions of wind speed class, by wind direction sector, by stability category, known as STAR summaries (for STability ARray).

For state permit applications, STAR summaries for each of 5 years as specified in Appendix C should be used. For PSD permit applications, a modeler should create STAR summaries for each of the most recent, readily available 5 years of data (EPA, 1995e), unless the PMU staff has placed processed data sets on the OnLine BBS. The meteorological data period used to determine PSD compliance can also be used for any associated state permit modeling.

5.6.3 ** Anemometer Height

Modelers should use the actual height of the anemometer that measured the wind speed observations at the surface station used in the modeling demonstration.

Anemometer heights for selected surface stations in Texas are available from the PMU staff and also on the OnLine BBS.

5.6.4 Replacement of Meteorological Data

Missing meteorological data must be replaced before these data can be processed for dispersion modeling. A modeler should follow the guidance in *Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models* (Atkinson, 1992) to replace missing values.

Replacement of missing data must follow standard procedures. Occasionally, a modeler may propose to use meteorological data which is not available on the SCRAM BBS or data which is available on the SCRAM BBS but not complete. In these cases, modelers must document and submit all occurrences of missing data and proposed replacement values for the PMU staff's approval before performing any modeling.

5.6.5 ** Replacement of Low Mixing Heights

Occasionally, the PCRAMMET program will generate low hourly mixing heights near the hours at and just after sunrise. These low heights may cause the model to predict unrealistically high concentrations for ground-based and other sources with low release heights. Since the mixing height is assumed to be constant until the next hour modeled, a mixing height near sunrise may not be representative of the rapid warming that occurs at and just after sunrise. To mitigate this effect and to provide a more representative concentration, the heights near sunrise can be replaced with the next hour's mixing height or 30 meters, whichever is higher.

The PMU staff should approve changes to any data set before a modeler uses it.

6.0 Guidance for Modeling Specific Types of Sources

The guidance discussed in this section addresses some, but not all, possible ways to model certain types of non-point, non-traditional sources. The modeler should discuss new or innovative procedures with the PMU staff before final modeling is conducted.

6.1 Pseudo-Point Sources

If the Permits staff determines it is necessary to model emissions from fugitive sources, and if the use of pseudo-point sources is appropriate, then the following modeling parameters should be used:

- Stack exit velocity = 0.001 meter per second;
- Stack exit diameter = 1 meter;
- ** Stack exit temperature = 0 Kelvin (causes the ISC model to use the ambient temperature as the exit temperature); and,
- Actual release height.

There are a number of source types which do not release to the atmosphere through standard stacks. Examples are stacks or vents with rain caps, and stacks or vents that release emissions horizontally. These release points should be modeled as stacks; however, the stack parameters used should cause the model to correctly simulate the way the release is dispersed in the atmosphere. Release points that have rain caps or that do not release vertically should be modeled with the fugitive parameters.

Other approaches may be taken if the modeler can show that the non-standard point sources being modeled have buoyancy or momentum flux and that their suggested modeling parameters will provide representative impacts.

6.2 ** Volume Sources

The volume source algorithm may be used to simulate three-dimensional emission sources, such as vents on building roofs, multiple vents from a building, fugitive emissions from pipes, conveyor belts, roads, etc. Parameters needed are the volume emission rate, the release height, and the initial horizontal and vertical dimensions of the volume.

The release height is the center of the volume above the ground. The modeler determines the initial horizontal (σ_{y0}) and vertical (σ_{z0}) dimensions--also known as the initial sigmas--for the volume source. The guidance for developing σ_{y0} and σ_{z0} is contained in the ISC User's Guide.

The base of the volume source must be square. If the base is not square, the modeler may model the source as a series of adjacent volume sources, each with a square base. For relatively uniform sources, the modeler may determine an equivalent square by taking the square root of the area of the length and width of the volume base.

6.3 ** Area Sources

An area source is a two-dimensional low-level or ground-level source from which pollutants are emitted with no plume rise, such as a storage pile, slag dump, landfill, holding pond, etc. Parameters needed are the area emission rate, the release height, the initial lengths of the X and Y sides of the area, and the orientation angle in degrees from North. While detailed guidance is contained in the ISC User's Guide (EPA, 1995d), some factors to consider follow.

Instead of total emissions from the area source, an emission rate per unit area is used; that is, the total emissions in grams-per-second divided by the total area in square meters.

If the area source is square, the initial Y parameter may be omitted.

If the area is oriented in the north-south and east-west directions, the angle is assumed to be zero and the angle parameter can be omitted.

The angle parameter is used to rotate the area clockwise around the vertex usually defined as the southwest corner of the area. However, the location of the vertex is not critical if the following relationships are maintained: the initial X dimension is measured from the side of the area that is counterclockwise along the perimeter from the vertex. The initial Y dimension is measured from the side of the area that is clockwise from the vertex. The angle parameter is measured from North to the side that is clockwise from the vertex; this will be the Y side.

The length-to-width aspect ratio for area sources should be less than 10 to 1. If this ratio is exceeded, the area should be subdivided to achieve a 10 to 1 ratio or less for all subareas.

The model integrates over the portion of the area that is upwind of a receptor so receptors may be placed within the area and at the edge of the area as long as the receptor is not closer than 1 meter.

6.4 ** Open Pit Sources

An open pit source is a three-dimensional source such as surface coal mines and rock quarries. Parameters needed are the open pit emission rate, the average release height, the initial lengths of the X and Y sides of the open pit, the volume of the open pit, and the orientation angle in degrees from North. While detailed guidance is contained in the ISC User's Guide (EPA, 1995d), some factors to consider follow.

As with the area source, an emission rate per unit area is used; that is, the total emissions in grams-per-second divided by the total area in square meters.

The release height above the base of the open pit cannot exceed the effective depth of the pit, which is calculated by the model based on the length, width, and volume of the pit. A release height of zero indicates emissions that are released from the base of the pit.

Unlike the area source, the initial Y parameter may not be omitted.

If the open pit is oriented in the north-south and east-west directions, the angle is assumed to be zero and the angle parameter can be omitted.

The angle parameter is used to rotate the open pit clockwise around the vertex usually defined as the southwest corner of the area. However, the location of the vertex is not critical if the following relationships are maintained: the initial X dimension is measured from the side of the area that is counterclockwise along the perimeter from the vertex. The initial Y dimension is measured from the side of the area that is clockwise from the vertex. The angle parameter is measured from North to the side that is clockwise from the vertex; this will be the Y side.

The length-to-width aspect ratio for open pit sources should be less than 10 to 1. Unlike the area source, the open pit cannot be subdivided into sub pits. The applicant should characterize irregularly shaped pit areas by a rectangular shape of equal area.

Unlike the area source, receptors should not be placed within the boundaries of the pit.

6.5 Flares

Flares are a special type of elevated source which may be modeled as a point source. The technique to calculate buoyancy flux for flares generally follows the technique described in the *SCREEN3 Model User's Guide* (EPA, 1995b).

The following parameters should be used:

- o Effective stack exit velocity = 20 meters per second;
- o Effective stack exit temperature = 1273 Kelvin;
- o Actual height of the flare tip; and
- o Effective stack exit diameter. The effective stack diameter in meters is calculated using the following equation:

  where:

$$D=\sqrt{(10^{-6}q_n)}$$

and:

$$q_n = q(1-0.048\sqrt{MW})$$

where:

q = gross heat release in cal/sec; and,

MW = weighted (by volume) average molecular weight of the compound being flared.

Note that enclosed vapor combustion units should not be modeled with the above parameters but instead with stack parameters which reflect the physical characteristics of the unit.

6.6 Roads

Determining an emission rate for fugitive particulates generated by traffic on roads may be difficult. Calculations to determine these emission rates have a number of variables, most of which cannot be determined accurately. In addition, the values for these variables can vary over a wide range and in many cases depend upon recent meteorological events, such as rainfall. The *Compilation of Air Pollutant Emission Factors (*AP-42) (EPA, 1995c), indicates that unless site-specific information is used, a low confidence level is placed upon short-term emission rates from roads.

Due to this and other factors, the Permits staff may not require that the modeler include short-term emissions from roads in state permit modeling analyses. However, AP-42 assigns higher confidence levels to annual emission rates from road traffic. Accordingly, the Permits staff usually requires that annual road emissions be included in state permit modeling analyses. In addition, the Permits staff usually requires the modeler to include both short- and long-term road emissions in PSD modeling analyses. The road emissions can be divided into a number of volume sources, as suggested in the ISC User's Guide, or as pseudo-points or elongated area sources.

6.7 ** Wind-Generated Particulate Emissions

Wind-generated particulate emissions from drop operations and working storage piles depend upon the wind speed, with the emission rate normally calculated based upon an average wind speed. Additionally, the fastest mile is used to estimate wind-blown emissions from standing storage piles (EPA, 1995c). The predicted concentrations from these sources may be too conservative since wind speeds will vary in the model--but the emission rates are based on a fixed wind speed.

The modeler can make adjustments in the screening or refined analysis to compensate for this effect.

For example:

- Screening analysis. Enter into the SCREEN model the wind speed used to determine the emission rate with each applicable stability class according to Table 2 in the SCREEN user's guide (EPA, 1995b). For example, if the wind speed was 11 meters-per-second (m/s), run the model twice: once for a wind speed of 10 m/s and stability class C, and again for stability class D. Use the highest predicted concentration.

- Refined analysis. Enter into the ISCST model the appropriate emission-rate scalar for each wind-speed category. Calculate the scalar based on the ratio of each wind-speed category upper-bound value to the average wind speed used to determine the emission rate. Raise the ratio to the 1.3 power and use the resulting scalar for each of the six wind categories.

  For example, assume the average wind speed used to calculate the emission rate is 5.36 m/s. To determine the scalar for the first wind category, divide the upper bound of the first wind category by the average wind speed and raise the result to the 1.3 power, or $(1.54 \text{ m/s} \div 5.36 \text{ m/s})^{1.3} = 0.197$.

There may be other approaches. The PMU staff should review and comment on any approach before a modeler uses it. The PMU staff is developing a more detailed guidance document which will be placed on the OnLine BBS when it is done.

7.0 Reporting Requirements

The air quality analysis report should include a clear, concise written discussion covering the project, the modeling performed, and the impacts relative to applicable standards or guidelines. This analysis should contain at least the items in Appendix F.

The air quality analysis report is a stand-alone document. Results from the report should be sufficient to make a decision without input from other reports. The modeler should not refer to other documents or reports for data required to be in the report. In addition, items should not be excluded without coordination with the PMU staff, unless the items are clearly not applicable to the project. Following the reporting requirements should expedite the technical review of the air quality analysis and could also result in the elimination of unnecessary modeling.

8.0 Transmittal of the Air Quality Analysis Report

The air quality analysis report should be sent to the permit engineer. In addition, for PSD applications, a copy of the air quality analysis report should be sent to EPA Region VI New Source Review Section (6T-AN), but without paper copies of the modeling and downwash files. Instead, send diskettes. The TNRCC permit engineer reviews the report and determines the need for a technical review, or audit, by the modeling staff.

8.1 Request for Modeling Staff Technical Review

Frequently, the Permits staff requests that the PMU staff conduct a technical review--or audit--of an air quality analysis. The purpose of the review is to ensure that the procedure used to demonstrate compliance with applicable standards or guidelines was technically correct and that the predicted concentrations can be used in the technical review process.

If a review is required, the permit engineer sends an audit request to the PMU scheduler who then assigns the project to one of the PMU staff.

Normal turnaround time is from 2-4 weeks depending upon overall unit workload, complexity of the project, completeness of the submittal, and deficiencies that must be evaluated.

8.2 Modeling Technical Review Process

Before the technical review begins, the PMU modeler contacts the applicant's modeler to advise that he or she will review the air quality analysis. As the review progresses, the PMU modeler provides the status of the review as appropriate to the modeler and the permit engineer.

The audit is done to ensure that the modeling output is technically representative and sufficient, and that any deviations from guidance do not significantly affect the compliance demonstration.

To assist the PMU staff, the modeler should follow reporting requirements and provide clear documentation of how the modeling was done and what assumptions were made. In addition, any calculations that were necessary to develop the input data required to run the selected model should be included in the air quality analysis.

If the PMU modeler finds errors or discrepancies, the modeler tries to evaluate them and determine if they would cause a significant change in the magnitude or location of predicted concentrations. That is, the concentrations would be technically representative and useable by the staff for determining whether the permit should be issued. The PMU modeler will work closely with the permit engineer and the applicant's modeler to resolve omissions, unclear documentation, etc.

If the PMU modeler cannot resolve a modeling deficiency, then the modeling submittal is not accepted and recommended corrective actions are forwarded to the permit engineer.

9.0 Common Shortfalls in Modeling Reports

Evaluating or correcting modeling shortfalls during the modeling technical review process takes time--which lengthens the overall permitting process. The PMU staff routinely finds similar errors, discrepancies, or omissions in modeling reports. The staff believes that modelers can identify and correct most shortfalls during the quality control process if they understand the audit process and can recognize them. Therefore, some specific examples of potential shortfall areas follow.

9.1 Modeling Emissions Inventory

The modeling emissions inventory is one of the most important parts of the modeling demonstration. Modelers should ensure that the data entered into the modeling files match the data represented in the body of the report. For example:

- Ensure emission rates, source locations, or stack parameters entered into the modeling input files agree with corresponding parameters listed on the Table 1(a) or other data represented in the report. Table 1(a) data are representations in the permit application, and the modeling should reflect these data.

- Match emission point identifiers used in the Table 1(a) with those used in the modeling input files. That is, the nomenclature or emission point identification scheme used in the modeling should not be different than the one used in the permit application or air quality analysis.

- Include all emission points represented in the permit application in the modeling demonstration.

9.2 Plot Plans or Area Maps

The plot plans and area maps submitted with the permit application do not normally need the detail required for a modeling demonstration. However, once the Permits staff requests that modeling be conducted, additional details should be added to the plans and maps as necessary to conduct modeling or audit the modeling process. That is, modelers should ensure that plot plans or area maps have enough information to accurately determine the location of emission points; locations and dimensions of downwash structures; property lines; locations of sensitive receptors; terrain elevations, etc.

9.3 Building Wake Effects (Downwash)

Downwash can significantly affect dispersion. Modelers should use the Building Profile Input Program (BPIP) to determine downwash parameters. They should ensure that the data entered into the BPIP match the data represented in the body of the report. For example:

- o Ensure that data listed in downwash input files, Table 1(a), plot plan, and modeling input files match. These data include source location, base elevation, and height; and, source identifiers referred to in the modeling emissions inventory section.

- o Annotate the base elevations and dimensions (length, width, and height) of the structures used in the BPIP on the plot plan or in a supplemental table.

- o Include all structures indicated on the plot plan in the BPIP unless they clearly could not be downwash structures for the stacks being modeled .

- o Consider all potential downwash structures. While wake effects are commonly referred to as "building downwash," tanks and permanent land features could also be downwash structures.

9.4 Receptor Grid

The number of receptors in a grid is one of the key factors modelers consider when determining computer run time. However, modelers should ensure that time, or cost considerations, do not impact the completeness of the modeling demonstration. For example:

- o Design grids with receptors spaced close enough and at a distance far enough to demonstrate that the maximum concentration was found. If receptors are spaced too far apart, predicted concentrations could be significantly lower than they would be if intermediate receptors were added. In addition, the grid should extend far enough to show that concentrations are decreasing. More receptors are needed if concentrations increase at the edge of the grid.

- o Design grids to completely define the area of impact. The grid should extend far enough to demonstrate that concentrations have decreased below the applicable de minimis.

- o Avoid using a hot-spot technique. That is, do not place fine or tight grids only near the highest concentration found on the coarse receptor grid. Concentrations slightly below the maximum concentration may be predicted in other areas, and those areas should be evaluated also.

- o Use receptor elevations in simple-to-complex terrain. Predicted concentrations can increase significantly if the terrain in the vicinity of the sources is near or above the height of the sources.

9.5 Auer Land-Use Analysis

The selection of dispersion coefficients are an important part of the modeling process. The primary method to determine these coefficients is the Auer land-use analysis. This analysis should be complete and have enough detail to justify the selection of the dispersion coefficients. If the land-use designation represents less than 70 percent of the total, a modeler should supplement the analysis as previously discussed.

9.6 Omitted or Incomplete Data

Modelers should ensure that all required concentration maps, modeling and downwash input and output files, boundary files, etc., are complete and submitted with the modeling report. Most data can be submitted on a diskette rather than in paper format. This saves paper yet gives the PMU modeler access to the data as required during the technical review process. In addition, if the PMU modeler finds an error, access to all the input files can be useful to determine if the error would cause a significant change in the magnitude or location of the predicted concentrations.

9.7 Meteorological Data

Several years ago the National Weather Service (NWS) had a goal to standardize anemometer heights at 10 meters. Consequently, most models, including the ISC models, have default anemometer heights set at 10 meters. Unfortunately, the NWS program was delayed. Since surface meteorological data may have been obtained from anemometers at various heights, modelers should ensure that the proper anemometer height is used in the modeling demonstration. Heights are available in the modeling section of the TNRCC OnLine BBS.

10.0 References

Atkinson, Dennis and Russell F. Lee, 1992: *Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models.*

Auer, A.H., 1978: *Correlation of Land Use and Cover with Meteorological Anomalies*, Journal of Applied Meteorology, 17:636-643.

EPA, 1985: *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations),* (Revised), EPA-450/4-80-023R, June, 1985. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1987a: *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)*, EPA-450/4-87-007, May, 1987. U.S. Environmental Protection Agency, Research Triangle Park, NC.

EPA, 1987b: *On-Site Meteorological Program Guidance for Regulatory Modeling Applications*, EPA-450/4-87-013, June, 1987. U.S. Environmental Protection Agency, Research Triangle Park, NC.

EPA, 1990: *Draft New Source Review Workshop Manual*, Draft, October, 1990. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1992a: *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources*, Revised, EPA-450/R-92-019, October, 1992. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1992b: *Workbook for Plume Visual Impact Screening and Analysis*, EPA-454/R-92-023, October, 1992. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1992c: *User's Manual for the Plume Visibility Model (PLUVUE II),* (Revised), EPA-454/B-92-008, September, 1992. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division, Research Triangle Park, NC.

EPA, 1993: *User's Guide to the Building Profile Input Program*, October, 1993. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division, Research Triangle Park, NC.

EPA, 1994: *Meteorological Processor for Regulatory Models (MPRM) User's Guide,* EPA-454/B-94-020, October, 1994. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division, Research Triangle Park, NC.

EPA, 1995a: *Guideline on Air Quality Models,* (Revised), EPA-450/2-78-027R-C August, 1995. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1995b: *SCREEN3 Model User's Guide*, EPA-454/B-95-004, September, 1995. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Research Triangle Park, NC.

EPA, 1995c: *Compilation of Air Pollutant Emission Factors,* AP-42, January, 1995. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

EPA, 1995d: *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models*, EPA-454/B-95-003a, September, 1995. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Research Triangle Park, NC.

EPA, 1995e: *PCRAMMET User's Guide*, October, 1995. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Research Triangle Park, NC.

TNRCC, 1987: 30 TAC Chapter 113 (Regulation III), *Control of Air Pollution From Toxic Materials*, October, 1987.

TNRCC, 1992: 30 TAC Chapter 112 (Regulation II), *Control of Air Pollution From Sulfur Compounds*, October, 1992.

TNRCC, 1994a: Interim Policy *Modeling and Effects Review Applicability Guidance Document for Non-Criteria Pollutants*, July, 1993 (Revised January 1994).

TNRCC, 1995a: 30 TAC Chapter 111 (Regulation I), *Control of Air Pollution From Visible Emissions and Particulate Matter,* April, 1995.

TNRCC, 1995a: 30 TAC Chapter 116 (Regulation VI), *Control of Air Pollution by Permits for New Construction or Modification,* October, 1995.

TNRCC, 1995b: *TNRCC OnLine User's Manual* (TNRCC's Electronic Bulletin Board Service), January, 1995.

40CFR52: Code of Federal Regulations, Title 40 (Protection of Environment), Part 52. Office of the Federal Register National Archives and Records Administration.

40CFR266: Code of Federal Regulations, Title 40 (Protection of Environment), Part 266. Office of the Federal Register National Archives and Records Administration.

Appendix A

Table A-1
Standards for Comparison With Modeling Results

Air Pollutant	Averaging Time	NAAQS Primary (µg/m³)	NAAQS Secondary (µg/m³)	TNRCC Regulation Standard	PSD Monitoring Significance (µg/m³)	De Minimis (µg/m³)	PSD Increment Class II Area (µg/m³)
Sulfur Dioxide	30-min.	—	—	0.4 ppm[(1)] (1021 µg/m³)	—	—	—
	3-hr.	—	1300	—	—	25	512
	24-hr.	365	—	—	13	5	91
	Annual	80	—	—	—	1	20
Total Suspended Particulate Matter	1-hr.	—	—	400 µg/m³	—	—	—
	3-hr.	—	—	200 µg/m³	—	—	—
Inhalable Particulate (PM_{10})	24-hr.	150	150	—	10	5	30
	Annual	50	50	—	—	1	17
Nitrogen Dioxide	Annual	100	100	—	14	1	25
Carbon Monoxide	1-hr.	40,000	—	—	—	2,000	—
	8-hr.	10,000	—		575	500	—
Lead	3-mo. (Calendar Quarter)	1.5	—	—	0.1	—	—
Ozone	1-hr.	235	235	—	—	—	—
Gaseous Inorganic Fluoride Compound (Calculated as HF)	3-hr.	—	—	6 ppb (4.9 µg/m³)[(2)]	—	—	—
	12-hr.	—	—	4.5 ppb (3.68 µg/m³)	—	—	—
	24-hr.	—	—	3.5 ppb (2.86 µg/m³)	0.25 (Total Fluorides)	—	—
	7-day	—	—	2.0 ppb (1.63 µg/m³)	—	—	—
	30-day	—	—	1.0 ppb (0.82 µg/m³)	—	—	—

Air Pollutant	Averaging Time	NAAQS Primary (µg/m³)	NAAQS Secondary (µg/m³)	TNRCC Regulation Standard	PSD Monitoring Significance (µg/m³)	De Minimis (µg/m³)	PSD Increment Class II Area (µg/m³)
Hydrogen Sulfide	30-min.	---	---	0.08 ppm[3] (108 µg/m³)		---	---
		---	---				
	1-hr.	---	---	0.12 ppm[4] 162 µg/m³	(6)	---	---
Sulfuric Acid	1-hr.	---	---	50 µg/m³	---	---	---
	24-hr.	---	---	15 µg/m³	---	---	---
Total Reduced Sulfur	1-hr.	---	---	---	10[5]	---	---
Reduced Sulfur Compounds	1-hr.	---	---	---	10[5]	---	---
Beryllium	24-hr.	---	---	0.01 µg/m³	(6)	---	---
Other Hazardous and Odorous Pollutants	1-hr.	---	---	(7)	---	---	---
	Annual	---	---	(7)	---	---	---

(1) Conversion from parts-per-million (ppm) to micrograms-per-cubic meter (µg/m³) assuming temperature = 90 degrees Fahrenheit (F) (TNRCC, 1992). Standard is 0.28 ppm (715 µg/m3) for Galveston and Harris Counties and 0.32 ppm (817 µg/m3) (net ground level concentration from all sources on-property) for Jefferson and Orange Counties.

(2) Conversion from parts-per-billion (ppb) to µg/m³ assuming temperature = 25 degrees Celsius (TNRCC, 1987).

(3) If it affects a residential area, business, or commercial property.

(4) If it affects only property used for other than residential, recreational, business or commercial purposes.

(5) 40 CFR 52.21 (I)(8)(I). Acceptable monitoring techniques may not be available at this time.

(6) Under Title III of the Federal Clean Air Act of 1990, these hazardous air pollutants are exempted from PSD applicability.

(7) Not defined in a specific regulation but determined on a case-by-case basis. See the TNRCC OnLine BBS or contact the TARA staff to obtain current ESLs.

Appendix B

Ratio Techniques

Ratio Technique 1:

This technique uses a unit emission rate (1 pound-per-hour or 1 gram-per-second) to determine if the maximum contribution from each permitted source when added together, independent of time and space, could exceed a standard or ESL. This is a conservative procedure since the maximum concentration from all sources modeled concurrently cannot be more than the sum of the maximum concentration from each source modeled separately.

Each source is evaluated separately with a unit emission rate, such as 1 pound-per-hour or 1 gram-per-second; the source's actual location; and the source's proposed stack parameters represented in the permit application. In the ISC models this is done by setting up a separate source group for each source. The SCREEN model can also be used for this demonstration with a separate SCREEN model run for each source.

The maximum predicted concentration for each source is then multiplied by the appropriate emission rate factor for each source and for each pollutant. The emission rate factor is the ratio of the approved emission rate divided by the unit emission rate.

The sum of the maximum concentrations (for each pollutant, independent of time and space) is then compared with the threshold of concern for each pollutant. If the sum for any pollutant is greater than that value, then refined modeling may be required and if so, the emission rate for each source for this pollutant should be entered into the model for additional evaluation so that time and space are considered.

Determining individual source contributions to the ALL source group maximum concentration in the ISC model is not appropriate unless there is only one source or the pollutants are emitted in exactly the same amount for all sources, or pollutants are emitted in exactly the same ratio for all sources.

Ratio Technique 2:

One pollutant is modeled for all sources with TNRCC approved emission rates and stack parameters. Other TNRCC approved pollutant emission rates are then compared with the modeled pollutant emission rate to determine the source which has the maximum ratio. This maximum ratio is then multiplied by the predicted maximum off-property concentration for the pollutant modeled. If the resulting maximum concentration exceeds a value of concern, then additional refined modeling may be needed and, if so, the emission rate for each source of this pollutant should be entered into the model.

** Ambient Ratio Method:

The EPA has adopted a new method to determine concentrations for nitrogen dioxide. Modelers should follow procedures outlined in the GAQM, Section 6.2.3 (EPA, 1995a). The modeler may apply the ratio method during screening modeling as well as refined modeling.

This method applies to conversion of nitrogen oxides (NO_x) to obtain an annual average estimate for nitrogen dioxide (NO_2), and consists of two tiers.

- o Tier 1: Conduct screening or refined modeling and assume total conversion of NO_x to NO_2.
- o Tier 2a: Multiply the actual NO_X emission rate by a measured NO_2 / NO_x ratio or the national default of 0.75. Conduct screening or refined modeling.
- o Tier 2b: Conduct screening or refined modeling with the actual NO_X emission rate. Multiply the annual NO_X estimate by a measured NO_2 / NO_X ratio or the national default of 0.75.

Appendix C

Meteorological Stations By County

Table C-1 contains a composite listing of meteorological stations and counties to standardize the selection of meteorological data for Texas permit applications. Suggested National Weather Service surface, upper-air, and STAR stations are specified for each county. A modeler may suggest other data sets if they would be more representative for the source location. Table C-2 contains National Weather Service stations, call signs, and identification numbers.

The PMU staff has preprocessed meteorological data sets for state modeling, but has not preprocessed sets for PSD modeling yet. However, a staff goal is to provide all meteorological data for both state and PSD modeling. The staff will place a notice on the TNRCC OnLine BBS as data sets are created.

The required year for short-term state modeling is currently 1988 (or 1989 for Shreveport data sets). The required years for long-term state modeling are currently 1985 through 1989 (1985-1987, 1989-1990 for Shreveport). Required years for PSD modeling are the most recent, readily available 5 years for both short-term and long-term modeling. For example, for permit modeling in Anderson County:

- State Permit
  Short term - Waco surface and Longview upper-air data from 1988;
  Long term - Waco STAR data for each year of the 5-year period from 1985 through 1989.

- PSD Permit
  Short term - Waco surface and Longview upper-air data for each year of the appropriate 5-year period;
  Long term - Waco STAR data for each year of the appropriate 5-year period.

Table C-1
Listing of Meteorological Stations By County

County	Surface	Upper Air	STAR
Anderson	Waco	Longview	Waco
Andrews	Midland	Midland	Midland
Angelina	Shreveport	Longview	Shreveport
Aransas	Corpus Christi	Victoria	Corpus Christi
Archer	Wichita Falls	Stephenville	Wichita Falls
Armstrong	Amarillo	Amarillo	Amarillo
Atascosa	San Antonio	Del Rio	San Antonio
Austin	Austin	Victoria	Austin
Bailey	Lubbock	Amarillo	Lubbock
Bandera	San Antonio	Del Rio	San Antonio
Bastrop	Austin	Victoria	Austin
Baylor	Wichita Falls	Stephenville	Wichita Falls
Bee	Corpus Christi	Victoria	Corpus Christi
Bell	Waco	Stephenville	Waco
Bexar	San Antonio	Del Rio	San Antonio
Blanco	Austin	Del Rio	Austin
Borden	Midland	Midland	Midland
Bosque	Waco	Stephenville	Waco
Bowie	Shreveport	Longview	Shreveport
Brazoria	Houston Intercontinental	Lake Charles	Houston Intercontinental
Brazos	Austin	Victoria	Austin
Brewster	El Paso	El Paso	El Paso
Briscoe	Amarillo	Amarillo	Amarillo
Brooks	Brownsville	Brownsville	Brownsville
Brown	San Angelo	Stephenville	San Angelo
Burleson	Austin	Victoria	Austin
Burnet	San Angelo	Stephenville	San Angelo

County	Surface	Upper Air	STAR
Caldwell	Austin	Victoria	Austin
Calhoun	Victoria	Victoria	Victoria
Callahan	Abilene	Stephenville	Abilene
Cameron	Brownsville	Brownsville	Brownsville
Camp	Shreveport	Longview	Shreveport
Carson	Amarillo	Amarillo	Amarillo
Cass	Shreveport	Longview	Shreveport
Castro	Amarillo	Amarillo	Amarillo
Chambers	Houston Intercontinental	Lake Charles	Houston Intercontinental
Cherokee	Shreveport	Longview	Shreveport
Childress	Amarillo	Amarillo	Amarillo
Clay	Wichita Falls	Stephenville	Wichita Falls
Cochran	Lubbock	Amarillo	Lubbock
Coke	San Angelo	Midland	San Angelo
Coleman	San Angelo	Stephenville	San Angelo
Collin	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Collingsworth	Amarillo	Amarillo	Amarillo
Colorado	Victoria	Victoria	Victoria
Comal	San Antonio	Del Rio	San Antonio
Comanche	San Angelo	Stephenville	San Angelo
Concho	San Angelo	Stephenville	San Angelo
Cooke	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Coryell	Waco	Stephenville	Waco
Cottle	Lubbock	Amarillo	Lubbock
Crane	Midland	Midland	Midland
Crockett	Midland	Midland	Midland
Crosby	Lubbock	Amarillo	Lubbock
Culberson	El Paso	El Paso	El Paso
Dallam	Amarillo	Amarillo	Amarillo

County	Surface	Upper Air	STAR
Dallas	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Dawson	Midland	Midland	Midland
Deaf Smith	Amarillo	Amarillo	Amarillo
Delta	Shreveport	Longview	Shreveport
Denton	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
De Witt	Victoria	Victoria	Victoria
Dickens	Lubbock	Amarillo	Lubbock
Dimmit	San Antonio	Del Rio	San Antonio
Donley	Amarillo	Amarillo	Amarillo
Duval	San Antonio	Del Rio	San Antonio
Eastland	Abilene	Stephenville	Abilene
Ector	Midland	Midland	Midland
Edwards	San Antonio	Del Rio	San Antonio
Ellis	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
El Paso	El Paso	El Paso	El Paso
Erath	Abilene	Stephenville	Abilene
Falls	Waco	Stephenville	Waco
Fannin	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Fayette	Austin	Victoria	Austin
Fisher	Abilene	Stephenville	Abilene
Floyd	Lubbock	Amarillo	Lubbock
Foard	Wichita Falls	Stephenville	Wichita Falls
Fort Bend	Houston Intercontinental	Lake Charles	Houston Intercontinental
Franklin	Shreveport	Longview	Shreveport
Freestone	Waco	Longview	Waco
Frio	San Antonio	Del Rio	San Antonio
Gaines	Midland	Midland	Midland
Galveston	Houston Intercontinental	Lake Charles	Houston Intercontinental
Garza	Lubbock	Amarillo	Lubbock

County	Surface	Upper Air	STAR
Gillespie	San Angelo	Del Rio	San Angelo
Glasscock	Midland	Midland	Midland
Goliad	Victoria	Victoria	Victoria
Gonzales	San Antonio	Victoria	San Antonio
Gray	Amarillo	Amarillo	Amarillo
Grayson	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Gregg	Shreveport	Longview	Shreveport
Grimes	Houston Intercontinental	Victoria	Houston Intercontinental
Guadalupe	San Antonio	Victoria	San Antonio
Hale	Lubbock	Amarillo	Lubbock
Hall	Amarillo	Amarillo	Amarillo
Hamilton	San Angelo	Stephenville	San Angelo
Hansford	Amarillo	Amarillo	Amarillo
Hardeman	Wichita Falls	Stephenville	Wichita Falls
Hardin	Beaumont	Lake Charles	Beaumont
Harris	Houston Intercontinental	Lake Charles	Houston Intercontinental
Harrison	Shreveport	Longview	Shreveport
Hartley	Amarillo	Amarillo	Amarillo
Haskell	Abilene	Stephenville	Abilene
Hays	Austin	Victoria	Austin
Hemphill	Amarillo	Amarillo	Amarillo
Henderson	Waco	Longview	Waco
Hidalgo	Brownsville	Brownsville	Brownsville
Hill	Waco	Stephenville	Waco
Hockley	Lubbock	Amarillo	Lubbock
Hood	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Hopkins	Shreveport	Longview	Shreveport
Houston	Waco	Longview	Waco
Howard	Midland	Midland	Midland

County	Surface	Upper Air	STAR
Hudspeth	El Paso	El Paso	El Paso
Hunt	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Hutchinson	Amarillo	Amarillo	Amarillo
Irion	San Angelo	Midland	San Angelo
Jack	Abilene	Stephenville	Abilene
Jackson	Victoria	Victoria	Victoria
Jasper	Shreveport	Lake Charles	Shreveport
Jeff Davis	El Paso	El Paso	El Paso
Jefferson	Beaumont	Lake Charles	Beaumont
Jim Hogg	San Antonio	Del Rio	San Antonio
Jim Wells	Corpus Christi	Brownsville	Corpus Christi
Johnson	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Jones	Abilene	Stephenville	Abilene
Karnes	San Antonio	Victoria	San Antonio
Kaufman	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Kendall	San Antonio	Del Rio	San Antonio
Kenedy	Brownsville	Brownsville	Brownsville
Kent	Lubbock	Amarillo	Lubbock
Kerr	San Antonio	Del Rio	San Antonio
Kimble	San Angelo	Del Rio	San Angelo
King	Lubbock	Amarillo	Lubbock
Kinney	San Antonio	Del Rio	San Antonio
Kleberg	Corpus Christi	Brownsville	Corpus Christi
Knox	Wichita Falls	Stephenville	Wichita Falls
Lamar	Shreveport	Longview	Shreveport
Lamb	Lubbock	Amarillo	Lubbock
Lampasas	San Angelo	Stephenville	San Angelo
La Salle	San Antonio	Del Rio	San Antonio
Lavaca	Victoria	Victoria	Victoria

County	Surface	Upper Air	STAR
Lee	Austin	Victoria	Austin
Leon	Waco	Longview	Waco
Liberty	Houston Intercontinental	Lake Charles	Houston Intercontinental
Limestone	Waco	Stephenville	Waco
Lipscomb	Amarillo	Amarillo	Amarillo
Live Oak	Corpus Christi	Victoria	Corpus Christi
Llano	San Angelo	Del Rio	San Angelo
Loving	Midland	Midland	Midland
Lubbock	Lubbock	Amarillo	Lubbock
Lynn	Lubbock	Amarillo	Lubbock
Madison	Waco	Longview	Waco
Marion	Shreveport	Longview	Shreveport
Martin	Midland	Midland	Midland
Mason	San Angelo	Del Rio	San Angelo
Matagorda	Victoria	Victoria	Victoria
Maverick	San Antonio	Del Rio	San Antonio
McCulloch	San Angelo	Stephenville	San Angelo
McLennan	Waco	Stephenville	Waco
McMullen	San Antonio	Del Rio	San Antonio
Medina	San Antonio	Del Rio	San Antonio
Menard	San Angelo	Stephenville	San Angelo
Midland	Midland	Midland	Midland
Milam	Austin	Victoria	Austin
Mills	San Angelo	Stephenville	San Angelo
Mitchell	Midland	Midland	Midland
Montague	Wichita Falls	Stephenville	Wichita Falls
Montgomery	Houston Intercontinental	Lake Charles	Houston Intercontinental
Moore	Amarillo	Amarillo	Amarillo
Morris	Shreveport	Longview	Shreveport

County	Surface	Upper Air	STAR
Motley	Lubbock	Amarillo	Lubbock
Nacogdoches	Shreveport	Longview	Shreveport
Navarro	Waco	Stephenville	Waco
Newton	Shreveport	Lake Charles	Shreveport
Nolan	Abilene	Stephenville	Abilene
Nueces	Corpus Christi	Brownsville	Corpus Christi
Ochiltree	Amarillo	Amarillo	Amarillo
Oldham	Amarillo	Amarillo	Amarillo
Orange	Beaumont	Lake Charles	Beaumont
Palo Pinto	Abilene	Stephenville	Abilene
Panola	Shreveport	Longview	Shreveport
Parker	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Parmer	Amarillo	Amarillo	Amarillo
Pecos	Midland	Midland	Midland
Polk	Shreveport	Lake Charles	Shreveport
Potter	Amarillo	Amarillo	Amarillo
Presidio	El Paso	El Paso	El Paso
Rains	Dallas/Ft. Worth	Longview	Dallas/Ft. Worth
Randall	Amarillo	Amarillo	Amarillo
Reagan	Midland	Midland	Midland
Real	San Antonio	Del Rio	San Antonio
Red River	Shreveport	Longview	Shreveport
Reeves	Midland	Midland	Midland
Refugio	Corpus Christi	Victoria	Corpus Christi
Roberts	Amarillo	Amarillo	Amarillo
Robertson	Waco	Stephenville	Waco
Rockwall	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Runnels	San Angelo	Stephenville	San Angelo
Rusk	Shreveport	Longview	Shreveport

County	Surface	Upper Air	STAR
Sabine	Shreveport	Longview	Shreveport
San Augustine	Shreveport	Lake Charles	Shreveport
San Jacinto	Houston Intercontinental	Longview	Houston Intercontinental
San Patricio	Corpus Christi	Victoria	Corpus Christi
San Saba	San Angelo	Stephenville	San Angelo
Schleicher	San Angelo	Midland	San Angelo
Scurry	Midland	Midland	Midland
Shackleford	Abilene	Stephenville	Abilene
Shelby	Shreveport	Longview	Shreveport
Sherman	Amarillo	Amarillo	Amarillo
Smith	Shreveport	Longview	Shreveport
Somervell	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Starr	San Antonio	Del Rio	San Antonio
Stephens	Abilene	Stephenville	Abilene
Sterling	San Angelo	Midland	San Angelo
Stonewall	Abilene	Stephenville	Abilene
Sutton	San Angelo	Del Rio	San Angelo
Swisher	Amarillo	Amarillo	Amarillo
Tarrant	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Taylor	Abilene	Stephenville	Abilene
Terrell	Midland	Midland	Midland
Terry	Lubbock	Amarillo	Lubbock
Throckmorton	Abilene	Stephenville	Abilene
Titus	Shreveport	Longview	Shreveport
Tom Green	San Angelo	Midland	San Angelo
Travis	Austin	Victoria	Austin
Trinity	Waco	Longview	Waco
Tyler	Shreveport	Lake Charles	Shreveport
Upshur	Shreveport	Longview	Shreveport

County	Surface	Upper Air	STAR
Upton	Midland	Midland	Midland
Uvalde	San Antonio	Del Rio	San Antonio
Val Verde	San Antonio	Del Rio	San Antonio
Van Zandt	Dallas/Ft. Worth	Longview	Dallas/Ft. Worth
Victoria	Victoria	Victoria	Victoria
Walker	Houston Intercontinental	Longview	Houston Intercontinental
Waller	Houston Intercontinental	Lake Charles	Houston Intercontinental
Ward	Midland	Midland	Midland
Washington	Austin	Victoria	Austin
Webb	San Antonio	Del Rio	San Antonio
Wharton	Victoria	Victoria	Victoria
Wheeler	Amarillo	Amarillo	Amarillo
Wichita	Wichita Falls	Stephenville	Wichita Falls
Wilbarger	Wichita Falls	Stephenville	Wichita Falls
Willacy	Brownsville	Brownsville	Brownsville
Williamson	Austin	Victoria	Austin
Wilson	San Antonio	Victoria	San Antonio
Winkler	Midland	Midland	Midland
Wise	Dallas/Ft. Worth	Stephenville	Dallas/Ft. Worth
Wood	Shreveport	Longview	Shreveport
Yoakum	Lubbock	Amarillo	Lubbock
Young	Abilene	Stephenville	Abilene
Zapata	San Antonio	Del Rio	San Antonio
Zavala	San Antonio	Del Rio	San Antonio

Table C-2
National Weather Service Stations, Call Signs, And Identification Numbers

Station	Call Sign	Number
Abilene	ABI	13962
Amarillo	AMA	23047
Austin	AUS	13958
Beaumont/Pt. Arthur	BPT	12917
Brownsville	BRO	12919
Corpus Christi	CRP	12924
Dallas/Ft. Worth	DFW	03927
Del Rio	DRT	22010
El Paso	ELP	23044
Houston Intercontinental	IAH	12960
Lake Charles	LCH	03937
Longview	GGG	03951
Lubbock	LBB	23042
Midland	MAF	23023
San Angelo	SJT	23034
San Antonio	SAT	12921
Shreveport	SHV	13957
Stephenville	SEP	13901
Victoria	VCT	12912
Waco	ACT	13959
Wichita Falls	SPS	13966

Appendix D

Protocol Requirements

A modeler should submit a modeling protocol for complex state or PSD permit modeling. The primary difference between a protocol and an analysis is the level of detail. The protocol serves as a checklist, or outline, of how the modeling should be conducted. The analysis documents how the modeling was actually conducted and contains detailed output.

A protocol should include the items in Table D-1, as appropriate. Items apply to both state and PSD analyses unless otherwise noted. Items should not be excluded without prior coordination with the PMU staff.

Table D-1
Protocol Preparation Checklist

1.0	**Project Identification Information** Provide the following information to clearly identify the analysis:
	Applicant
	Facility
	Permit Application Number
	Nearest City and County
	Applicant's Modeler
2.0	**Project Overview** Provide a brief discussion of the plant process(es), and types and locations of emissions under consideration.
	See attached sheet for project overview.
2.1	**Type of Permit Review** Indicate the type of permit review required by the TNRCC Permits staff.
2.2	**Pollutants To Be Evaluated** List all pollutants to be evaluated.
3.0	**Plot Plan** Depending on the scope of the project, several plot plans may be needed to present all requested information. Provide a plot plan that includes:
	A clearly marked scale.
	All property lines. For PSD, include fence lines.
	A true-north arrow.
	UTM coordinates along the vertical and horizontal borders (Please do not use plant or other coordinates).
	Reference UTM coordinates and locations of all emission points including fugitive sources modeled.
	Buildings and structures on-property or off-property which could cause downwash. Provide length, width, and height.
	An indication of the shortest distance to the property line from any of the sources in the facility to be permitted.

4.0	**Area Map** (More than one map may be required)
4.1	**For State Analyses** Provide a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement) and cover the area within a 1-mile radius of the facility.
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map.
	For all state reviews, annotate schools within 3,000 feet of the sources nearest to the property line.
	For health effects reviews, annotate the nearest residents.
	For hazardous waste permits, annotate locations of churches, day care centers, health care facilities, dedicated public parks or similar facilities, and dedicated water supplies.
4.2	**For PSD Analyses** Provide a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement).
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map.
	Provide maps that show the location of:
	PSD Class I areas within 100 kilometers (km).
	Urban areas, nonattainment areas, and topographic features within 50 km or the distance to which the source has a significant impact, whichever is less.
	Any on-site or local meteorological stations, both surface and upper air.
	State/local/on-site ambient air monitoring sites within 50 km or the distance to which the source has a significant impact, whichever is less.
5.0	**Air Quality Monitoring Data (For PSD)** Provide a summary of existing observations for the latest 5 years within 50 km or the distance to which the source has a significant impact, whichever is less.
	Compare the existing air quality with the NAAQS.
	Provide a summary of observations from a site-specific monitoring network, if applicable. Ideally, a monitoring analysis should be conducted before the PSD permit application is submitted, as monitoring could take as long as one year if representative monitored data is not available.
	Discuss how ambient background concentrations will be obtained.
6.0	**Modeling Emissions Inventory**
6.1	**On-Property Sources to be Permitted**
	Provide a copy of the Table 1(a) that was submitted with the permit application.

	Identify special source types such as covered stacks, horizontal exhausts, fugitive sources, area sources, open pit sources, volume sources, roads, stockpiles, flares, etc., and how they will be modeled.
	Specify particulate emissions as a function of particulate diameter ranges and density ranges, if applicable.
	In addition, it would be helpful to have a table with stack parameters converted to metric units.
6.2	**Other On-Property and Off-Property Sources** Advise how other on- and off-property sources' modeling parameters will be obtained.
6.3	**Stack Parameter Justification** Provide the basis for using the listed stack parameters (flow rates, temperatures, stack heights, velocities) if known before the protocol is submitted. This should include calculations if necessary for justification.
	At least 25 percent, 50 percent, 75 percent and 100 percent production or load levels should be evaluated, if the source could be operated at these reduced levels.
6.4	**Scaling Factors** Discuss how emission scalars will be developed and used in the modeling, if applicable.
7.0	**Models Proposed and Modeling Techniques** Identify proposed models, model version numbers, and the model entry data options (for example, regulatory default option, period option, etc.).
	Discuss any proposed specialized modeling techniques such as screening, collocating sources, ratioing, etc.
	Include assumptions and sample calculations as applicable.
8.0	**Selection of Dispersion Option** Submit an Auer land-use analysis for the area within 3 km of the sources being permitted. The selection of urban or rural dispersion coefficients should be based on the Auer land-use analysis; however, the population density method could also be used but is not a preferred method.
	Provide a color copy of the USGS map, if a USGS map was used in the analysis.
	Supplement the topographic map analysis with a current aerial photograph of the area surrounding the permitted sources, or with a detailed drive-through summary, to support a land-use designation, that represents less than 70 percent of the total area evaluated.
9.0	**Terrain** Discuss if terrain considerations could be applicable and how the terrain for individual receptors will be determined. If there is complex terrain, discuss proposed screening or refined procedures that could be used.

10.0	**Building Wake Effects (Downwash)** State whether the EPA's Building Profile Input Processor (BPIP) or a software package that employs the BPIP algorithms will be used.
11.0	**Receptor Grid** Discuss how the receptor grids will be determined for each type of analysis.
	Provide a diagram of each grid and include any reference labels or nomenclature, if available before the protocol is submitted.
12.0	**Meteorological Data** Indicate the surface station, surface station anemometer height, upper-air station, and period of record.
	For PSD, 5 consecutive years of the most recent, readily available, hourly and annual National Weather Service (NWS) data, or 1 or more years of on-site data.
	Discuss why and how any meteorological data was replaced, if done before the protocol is submitted.
13.0	**Modeling Results** Discuss how the modeling results relative to all applicable standards or guidelines will be presented. Tabulated results are preferred when several pollutants are addressed.
13.1	**Additional Impacts Analysis (For PSD)** Discuss what methods will be used to evaluate each of the following: growth, soils and vegetation, visibility and Class I area impact analyses, if any, for this project.

Appendix E

Permit Modeling Guidance Meeting Checklist

Table E-1 contains the Permit Modeling Guidance Meeting Checklist format. The table can be reproduced and filled out by hand or electronically. The PMU staff will place an electronic version on the OnLine BBS.

The modeler should complete a project-specific checklist and send it to the PMU modeler before the meeting if possible. This checklist serves as an abbreviated protocol for the modeling project and should be included in the air quality analysis report.

This checklist serves to document certain items and procedures as well to assist the modeler in conducting the modeling demonstration. The Permit Modeling Guidance Meeting Checklist should be used in conjunction with the Protocol and Air Quality Analysis Reporting Checklists as applicable.

Table E-1
Permit Modeling Guidance Meeting Checklist

1.0	**Project Identification Information**
	Applicant/Facility:
	Permit Application Number:
	Nearest City: County:
	Applicant's Modeler:
2.0	**Project Overview**
2.1	**Type of Permit Review**
	State Property Line____ State NAAQS___ PSD___
	State Health Effects___ State Disaster Review______
	Nonattainment______ Other____
2.2	**Pollutants To Be Evaluated**
	TSP___ PM_{10}___ CO______ NO_x___ Pb___
	SO_2___ H_2S____ H_2SO_4____ TRS___
	HF___ Be___ Hg____
	Speciated VOCs____ Other____
3.0	**Plot Plan**
	Shortest distance from any source to the property line_________
4.0	**Area Map**
	Deviations From Standard Guidance?______If Yes, attach comments.
4.1	**State Analyses**
	Schools within 3,000 feet?__________________
	Distance to nearest residents _______________

	Hazardous waste permit?_ If yes, evaluate impacts at location of churches, day care centers, health care facilities, dedicated public parks or similar facilities, and dedicated water supplies.
4.2	**PSD Analyses**
	Class I Areas Within 100 Km?______________
5.0	**Air Quality Monitoring Data**
	Provide for PSD analyses; other analyses as requested.
6.0	**Modeling Emissions Inventory**
6.1	**On-Property Sources In The Permit Application**
	Special Source Types
	Fugitive Sources_____ Covered Stacks____ Horizontal Exhausts___
	Area Sources____ Open Pits_____ Volume Sources____
	Flares____ Stockpiles____ Roads____ Other_____
	Techniques To Model Special Sources
	Follow *Air Quality Modeling Guidelines*_____
	Other__________ See attached sheet for details.
6.2	**Other On-Property And Off-Property Sources**
	Plant-Wide Modeling Required?_____
	Off-Property sources required if de minimis exceeded.
6.3	**Stack Parameter Justification**
	Load Evaluation Required?______
6.4	**Scaling Factors**
	Scaling Factors Applicable?_____
7.0	**Models Proposed and Modeling Techniques**
	Model (Version Number)

	ISCST (________) ISCLT(________) SCREEN(________) OTHER ________(________)
	Specialized Techniques
	Collocated Sources____ Ratioing_____ Other________________________
8.0	**Selection Of Dispersion Coefficients**
	Urban____ Rural____ How Determined?____
9.0	**Terrain**
	Flat___ Simple___ Complex___
10.0	**Building Wake Effects (Downwash)**
	EPA BPIP ______ Software package that employs BPIP algorithms _____
11.0	**Receptor Grid**
	Deviations From Standard Guidance?______ If Yes, attach comments.
12.0	**Meteorological Data**
	Short-Term Surface/Upper-Air Data Set (5 Years For PSD) Set__________________ Year(s)__________________
	Long-Term Stability Array Data Sets Set__________________ Years__________________
	Anemometer Height______
13.0	**Modeling Results**
	Deviations From Standard Guidance?______If Yes, attach comments.
14.0	**Modeling Runs and Hard Copy Output**
	Deviations From Standard Guidance?______If Yes, attach comments.

15.0	**Diskettes**
	Deviations From Standard Guidance?______If Yes, attach comments.
16.0	**Meeting Record**
	Date:
	Participants / Affiliation / Telephone #s: See Meeting Register.
17.0	**Remarks**
	See attached sheet for remarks.
18.0	**TNRCC Modeling Staff Signature** ______________________________ Date:

Appendix F

Air Quality Analysis Reporting Requirements

The air quality analysis submitted to the TNRCC in support of a state or PSD permit application becomes an addendum to the permit application. The analysis should include the items in Table F-1 as appropriate. Items apply to both state and PSD analyses unless otherwise noted. Items should not be excluded without prior coordination with the PMU staff.

Table F-1
Air Quality Analysis Reporting Checklist

1.0	**Project Identification Information** Provide the following information to clearly identify the analysis:
	Applicant
	Facility
	Permit Application Number
	Nearest City and County
	Applicant's Modeler
2.0	**Project Overview** Provide a brief discussion of the plant process(es), and types and locations of emissions under consideration.
2.1	**Type of Permit Review** Indicate the type of permit review required by the TNRCC Permits staff.
2.2	**Pollutants To Be Evaluated** List all pollutants that were evaluated.
3.0	**Plot Plan** Depending on the scope of the project, several plot plans may be needed to present all requested information. Provide a plot plan that includes:
	A clearly marked scale.
	All property lines. For PSD, include fence lines.
	A true-north arrow.
	UTM coordinates along the vertical and horizontal borders (Please do not use plant or other coordinates).
	Reference UTM coordinates and locations of all emission points including fugitive sources modeled. (Labels and coordinates given emission points on the plot plan should correlate with the information contained in the air quality analysis).
	Buildings and structures on-property or off-property which could cause downwash. Provide length, width, and height.
4.0	**Area Map** (More than one map may be required)

4.1	**For State Analyses** Provide a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement) and cover the area within a 1-mile radius of the facility.
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map.
	For all state reviews, annotate schools within 3,000 feet of the sources nearest to the property line.
	For health effects reviews, annotate the nearest residents.
	For hazardous waste permits, annotate locations of churches, day care centers, health care facilities, dedicated public parks or similar facilities, and dedicated water supplies.
4.2	**For PSD Analyses** Provide a copy of the area map submitted with the permit application. If the map is an extract, it should be full scale (no reduction or enlargement).
	Add UTMs to the horizontal and vertical dimensions of the map section, as well as the date and title of the map.
	Provide maps that show the location of:
	PSD Class I areas within 100 kilometers (km).
	Urban areas, nonattainment areas, and topographic features within 50 km or the distance to which the source has a significant impact, whichever is less.
	All NAAQS and increment consuming sources within 50 km which have a significant impact within the AOI if exceedances of a NAAQS or increment are predicted.
	Any on-site or local meteorological stations, both surface and upper air.
	State/local/on-site ambient air monitoring sites within 50 km or the distance to which the sources have a significant impact, whichever is less.
5.0	**Air Quality Monitoring Data (For PSD)** Provide a summary of existing observations for the latest 5 years within 50 km or the distance to which the source has a significant impact, whichever is less.
	Compare the existing air quality with the NAAQS and PSD increments, as applicable.
	Provide a summary of observations if a site-specific monitoring network was operated.
	Discuss how ambient background concentrations were obtained. If all nearby and background point sources were modeled how was double-counting of monitored background values addressed, if applicable.
6.0	**Modeling Emissions Inventory**

6.1	**On-Property Sources to be Permitted**
	Provide a copy of the Table 1(a) that was submitted with the permit application and subsequently approved by the permit engineer.
	Identify special source types such as covered stacks, horizontal exhausts, fugitive sources, area sources, open pit sources, volume sources, roads, stockpiles, flares, etc.
	Provide all assumptions and calculations used to determine as appropriate the size, sides, rotation angles, heights of release, initial dispersion coefficients, effective stack diameter, gross heat release and weighted (by volume) average molecular weight of the mixture being burned.
	Specify particulate emissions as a function of particulate diameter ranges and density ranges, if applicable.
	In addition it would be helpful to have a table with metric notation.
6.2	**Other On-Property and Off-Property Sources** Provide a paper copy of the PSDB retrieval for each pollutant.
	Provide an additional list for each pollutant for any sources modeled but were not included in the PSDB retrieval. This list should contain all the information required by the Table 1(a).
	For PSD, provide a list of secondary emissions, if applicable. Secondary emissions occur from any facility that is not a part of the facility being reviewed which would only be constructed or increase emissions as a result of the permitted project.
6.3	**Table Correlating the Emission Inventory Source Name and EPN with the Source Number in the Modeling Output** Provide a table that cross-references the source identification numbers used in the modeling if they are different from the emission point numbers in the Table 1(a) or from any additional list of sources.
6.4	**Stack Parameter Justification** Provide the basis for using the listed stack parameters (flow rates, temperatures, stack heights, velocities). This should include calculations if necessary for justification.
	If the production or load levels could be less than 100 percent, demonstrate how the modeled emission rates and stack parameters were obtained to produce the worst-case impacts (in certain cases lower production levels may result in higher predicted impact).
	At least 25 percent, 50 percent, 75 percent and 100 percent production or load levels should be evaluated, if the source could be operated at these reduced levels.
6.5	**Scaling Factors** Discuss how emission scalars were developed and used in the modeling demonstration. In addition, identify those scalars that should be included in an enforceable permit provision, such as restricted hours of operation.

7.0	**Models Proposed and Modeling Techniques** Provide a detailed discussion of the models that were used, model version numbers, and the model entry data options (for example, regulatory default option, period option, etc.).
	Discuss any specialized modeling techniques such as screening, collocating sources, ratioing, etc.
	Include assumptions and sample calculations if applicable.
8.0	**Selection of Dispersion Option** Submit an Auer land-use analysis for the area within 3 km of the sources being permitted. The selection of urban or rural dispersion coefficients should be based on the Auer land-use analysis; however, the population density method could also be used but is not a preferred method.
	Provide a color copy of the USGS map, if a USGS map was used in the analysis.
	Supplement the topographic map analysis with a current aerial photograph of the area surrounding the permitted sources, or with a detailed drive-through summary, to support a land-use designation, that represents less than 70 percent of the total area evaluated.
9.0	**Terrain** Discuss if terrain considerations were applicable and how the terrain for individual receptors was determined. If there was complex terrain, discuss screening or refined procedures that were used.
10.0	**Building Wake Effects (Downwash)** Discuss how downwash structures were determined and provide applicable information required to use the EPA's Building Profile Input Processor (BPIP). Submit all input files and files generated by the BPIP program.
11.0	**Receptor Grid** Discuss how the receptor grids were determined for each type of analysis.
	Provide a diagram of each grid and include any reference labels or nomenclature.
12.0	**Meteorological Data** Indicate the surface station, surface station anemometer height, upper-air station, and period of record.
	For PSD, 5 consecutive years of the most recent, readily available, hourly and annual National Weather Service (NWS) data, or 1 or more years of on-site data.
	Include a discussion of why and how any meteorological data was replaced.
13.0	**Modeling Results** Summarize and discuss the modeling results relative to all applicable standards or guidelines. Tabulated results are preferred when several pollutants are addressed.
	Present the maximum concentrations predicted for sensitive receptors separately and include the location of the receptor.

	For PSD, present tables for each analysis similar to the examples in Appendix G of the modeling guidelines.
	For PSD, discuss the accuracy of model estimates as compared to monitored data, for time periods when higher monitored than modeled values were observed.
13.1	**Additional Impacts Analysis (For PSD)** Provide the results of the additional impacts analysis for growth, soils and vegetation, visibility and Class I areas as applicable.
14.0	**Modeling Runs and Hard Copy Output** Provide model output per pollutant showing emission point numbers, locations, base elevation, and stack parameters. These entries should correlate with the Table 1(a), PSDB retrieval, and any other list of sources modeled.
	Provide a table of selected model options and any selected data such as meteorological stations and period of record, roughness heights, scalars, etc. The summary page produced by the model can be used, if appropriate.
	Provide gridded maps showing the maximum predicted ground-level concentration for each modeled receptor for each type of analysis required. For large modeling projects, with numerous pollutants, maps for all receptor grids may not be required if the modeler can demonstrate with the grids submitted that the maximum concentrations have been found. In addition, if predicted concentrations from a fine grid are less than about 50 percent of a threshold of concern, only a map depicting the receptor grid--without concentrations--is necessary.
	For complex projects, concentration isopleths may be used if the concentration gradient can be clearly shown to decrease and that the maximum concentration has been found. A mix of grid point maps and isopleth maps may be used as appropriate.
	Depict property lines on each map. For PSD, depict fence lines on each map.
	Provide gridded maps for each pollutant's concentration that exceeds an ESL showing the number of exceedances and magnitude of exceedance at each receptor. Property lines should be shown on each map.
15.0	**Diskettes** Provide all input and output files for each dispersion model run, including meteorological data.
	Provide all automated downwash program input and output files.
	Provide boundary files specifying coordinates for property lines.
	For PSD, provide boundary files specifying coordinates for fence lines.
	Provide all spreadsheet files used for comparison of predicted concentrations with standards or guidelines (this includes, but is not limited to, spreadsheet files used for ratio techniques).
16.0	**Permit Modeling Guidance Meeting Checklist** The permit modeling meeting checklist is optional. However, if a checklist was prepared it should be included with the air quality analysis.

Appendix G

Analyses Summary Sheets

Each AOI, NAAQS, or Increment analysis should contain a summary table of modeled results similar to those in Tables G-1, G-2, and G-3, that addresses the following elements:

- Pollutant: Include a separate summary for each pollutant; however, the summaries may be combined if appropriate. For example, for multiple pollutants emitted from a single stack and a ratio technique used to obtain a unit concentration.

- Averaging Time, Standard or De minimis: Provide the applicable averaging time and standard or de minimis.

- Grid Size: Identify the grid size (tight, fine, medium, coarse) used to locate the maximum impact for the year evaluated.

- Date, Time, and Location: Include these data for the maximum concentration for each year evaluated.

- Radius of Impact: Include the radius for the analysis, if applicable, for each time period and year evaluated.

- Concentration Rank: Indicate the rank of the reported concentration, such as high, first high (H1H), high, second high (H2H) as applicable. The AOI and state analyses always use the H1H concentrations and PSD NAAQS and increment analyses use the H2H concentrations for short-term standards and the H1H for long-term standards, with the exception of PM_{10}.

  For the 24-hour PM_{10} NAAQS analyses, the H6H concentration can be used if a 5-year period is evaluated; and for the annual PM_{10} NAAQS the highest 5-year average concentration can be used.

  Note that for any demonstration a higher concentration rank may be used to compare with a standard or guideline. That is, the H1H concentration could be used instead of the H2H concentration, since the H1H concentration would be higher and thus more conservative.

- Maximum Concentration: Identify the maximum concentration from any of the years evaluated.

- Background Concentration: Identify the background concentration for NAAQS analyses.

- Total Concentration: Provide the total concentration; that is, maximum concentration plus background concentration.

Table G-1
Area of Impact Analysis Summary

Pollutant: Grid:

Date/Time, Location, H1H (μg/m³)	Averaging Time ______ De Minimis______μg/m³	Averaging Time ______ De Minimis ______μg/m³	Averaging Time ______ De Minimis ______μg/m³
First Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Second Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Third Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Fourth Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Fifth Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
H1H Concentration			
Radius of Impact (m)			
Maximum Radius of Impact (m)			

Table G-2
NAAQS Analysis Summary

Pollutant: Grid:

Rank:

Date/Time, Location, Concentration (μg/m³)	Averaging Time ______ Standard ________μg/m³	Averaging Time ______ Standard ________μg/m³	Averaging Time ______ Standard ________μg/m³
First Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Second Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Third Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Fourth Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Fifth Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Overall Maximum Concentration			
Background Concentration			
Total Maximum Concentration			

Table G-3
Increment Analysis Summary

Pollutant: Grid:

Rank:

Date/Time, Location, Concentration (μg/m³)	3-Hour Increment ________μg/m³	24-Hour Increment________μg/m³	Annual Increment_________μg/m³
First Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Second Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Third Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Fourth Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Fifth Year/Julian Day/Hour			
Receptor UTM Easting			
Receptor UTM Northing			
Maximum Concentration			
Overall Maximum Concentration			

Appendix H

Point Source Data Base (PSDB) Retrievals

Inquiries or questions for PSDB retrieval information should be made to Customer Reports & Services, Information Resources (IR) Division--(512) 239-DATA(3282). Written requests are required to obtain a retrieval, and may be sent by fax to (512) 239-0888. Provide the following impact area parameters with your PSDB request:

- Pollutant. Identify the pollutant using one of the following designators: carbon monoxide (CO), oxides of nitrogen (NO_x), sulfur dioxide (SO_2), total suspended particulate matter (TSP), particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), lead (Pb), volatile organic compounds (VOC), or the specific 5-digit contaminant (contam) code for non-criteria pollutants. The Emissions Inventory staff may be contacted to obtain the contam codes.

- Type. Indicate the type of request: NAAQS or PSD Increment. The term "NAAQS" refers to both criteria and non-criteria pollutants. Therefore, a retrieval for benzene, for example, would also be identified as a "NAAQS" retrieval.

  PSD Increment retrievals are available for NO_x, SO_2, and PM_{10}.

- Term. Indicate the term of interest: Short (used to determine concentrations of 24 hours or less) or Long (used to determine concentrations of greater than 24 hours).

- Search Option. Indicate the search option for the radius of impact: Primary, Secondary, or Primary and Secondary.

  The "Primary" radius search option provides a report that includes all emission points located within the circle defined by the designated radius of impact. This option is usually used for PSD permit modeling retrievals.

  The "Secondary" radius search option causes the retrieval program to search for points out to 60 kilometers beyond the primary radius and factor emissions against distance to determine if the emission points have potential impact. If the emissions are found to be significant, they are included in the report.

  The combined "Primary and Secondary" options should be used for state permit modeling retrievals, since no points within the primary radius are retrieved in the secondary radius search.

- Universal Transverse Mercator (UTM) Zone. Provide the zone that the center point of the radius of impact is located in for each search option. The retrieval program will automatically take care of any overlap from one zone to another. Use either 13 (from the west border to 102 degrees longitude), 14 (between 102 and 96 degrees longitude), or 15 (east of 96 degrees longitude to the east border).

- Center Point of the Radius of Impact. Use UTM coordinates in meters to identify the center point of the radius of impact: UTM East (meters) and UTM North (meters).

- Radius of Impact. Provide the length of the radius of impact in meters. The maximum length is 9,999,999 meters. There is no minimum length; however, a minimum length of 1,000 meters is suggested.

  For PSD modeling projects, add 50,000 meters to the modeled radius of impact and provide the resultant value as the length.

This information is used by the retrieval program to locate all sources for the given pollutant which are within the radius of impact or sources which could have a significant impact within the radius of impact. For the requested pollutant, the program generates a written report that includes for each source: the source identification, TNRCC permit number or TNRCC account number, source parameters needed for modeling, and the location of the source. IR staff can provide a computer diskette with all sources found in the retrieval with the modeling parameters placed in the proper format for use with certain EPA models.